

TABLE OF CONTENTS OF SPECIAL PROVISIONS

Note: This Table of Contents has been prepared for the convenience of those using this contract with the sole express purpose of locating quickly the information contained herein; and no claims shall arise due to omissions, additions, deletions, etc., as this Table of Contents shall not be considered part of the contract.

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August 5, 2015
FEDERAL AID PROJECT NO. N/A
STATE PROJECT NO. 76-193

Improvements on I-84 Exit 63 EB Off-Ramp and Intersection of Route 30 & Route 83

Town of Manchester
Federal Aid Project No. N/A

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 816, 2004, as revised by the Supplemental Specifications dated January 2015 (otherwise referred to collectively as "ConnDOT Form 816") is hereby made part of this contract, as modified by the Special Provisions contained herein. . The State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), May 14, 2010 edition or latest issue, is hereby made part of this contract. If the provisions of this Manual conflict with provisions of other Department documents (not including statutes or regulations), the provisions of the Manual will govern. The Manual is available upon request from the Transportation Manager of Contracts. The Special Provisions relate in particular to the Improvements on I-84 Exit 63 EB Off-Ramp and Intersection of Route 30 & Route 83 in the Town of Manchester.

CONTRACT TIME AND LIQUIDATED DAMAGES

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to the business area, it is necessary to limit the time of construction work, which interferes with traffic as specified in Article 1.08.04 of the Special Provisions.

There will be three assessments for liquidated damages and they will be addressed in the following manner:

1. For this contract, an assessment per day for liquidated damages, at a rate of Two Thousand Seven Hundred Dollars (\$2,700.00) per day shall be applied to each calendar day the work runs in excess of the Three Hundred Sixty-Nine (369) allowed calendar days for the contract.
2. For this contract, an assessment per hour for liquidated damages shall be applied to each hour, or any portion thereof, in which the Contractor interferes with normal traffic operations during the restricted hours given in Article 1.08.04 of the Special Provisions. The liquidated damages shall be as shown in the following tables entitled "Liquidated Damages Per Hour" for each hour, or any portion thereof, in

which the Contractor interferes with normal traffic operations during the restricted hours.

For the purpose of administering this contract, normal traffic operations are considered interfered with when:

- a. Any portion of the travel lanes or shoulders is occupied by any personnel, equipment, materials, or supplies including signs.
- b. The transition between the planes of pavement surfaces is at a rate of one inch in less than fifteen feet longitudinally.

LIQUIDATED DAMAGES PER HOUR

SPN 76-193

Route I-84 EASTBOUND 3 Lane Section		
If Working Periods Extends Into	1 Lane A.M. Closure	1 Lane P.M. Closure
1st Hour of Restrictive Period	\$ 500	\$ 7,000
2 nd Hour of Restrictive Period	\$ 500	\$ 60,000
3rd Hour or any Subsequent Hour of Restrictive Period	\$ 500	\$ 80,000

For each hour shown on the Limitation of Operations charts designated with a “2,” the liquidated damages shown above for “1 Lane Closure” shall apply for each hour, or part thereof, when only two lanes are open to traffic.

For each hour shown on the Limitation of Operations charts designated with a “3,” the liquidated damages shown above for “1 Lane Closure” shall apply for each hour, or part thereof, if all travel lanes are not open to traffic.

For each hour shown on the Limitation of Operations charts designated with a “E,” the liquidated damages shown above for “1 Lane Closure” shall apply for each hour, or part thereof, if all available shoulder widths are not available to traffic.

Liquidated damages in the amount of \$500 shall apply for each hour, or part thereof, that the Contractor interferes with existing traffic operations on any ramps or turning roadways during the non-allowable hours.

3. For this Contract, an assessment per day for liquidated damages, at a rate of Two Thousand Dollars (\$2,000) per day shall be applied to each calendar day that the CCTV Cameras are not operational. The CCTV Camera Sites included in this Contract are the following:

- (Existing) CCTV Camera Site No. 3 (I-84 EB at Exit 63)

The contractor shall refer to the “Notice to Contractor – IMS Installation Qualifications”, “Notice to Contractor – IMS Installation” and Item No. 1112252A Equipment Operations special provisions for terms and conditions.

NOTICE TO CONTRACTOR – PRE-BID QUESTIONS AND ANSWERS

Questions pertaining to DOT advertised construction projects must be presented through the CTDOT Pre-Bid Q and A Website. The Department cannot guarantee that all questions will be answered prior to the bid date. **PLEASE NOTE - at 12:01 am, the day before the bid, the subject project(s) being bid will be removed from the Q and A Website, Projects Advertised Section, at which time questions can no longer be submitted through the Q and A Website. At this time, the Q and A for those projects will be considered final, unless otherwise stated and/or the bid is postponed to a future date and time to allow for further questions and answers to be posted.**

If a question needs to be asked the day before the bid date, please contact the Contracts Unit staff and email your question to dotcontracts@ct.gov immediately.

Contractors must identify their company name, contact person, contact email address and phone number when asking a question. The email address and phone number will not be made public.

The questions and answers (if any) located on the Q and A Website are hereby made part of the bid/contract solicitation documents (located on the State Contracting Portal), and resulting contract for the subject project(s). It is the bidder's responsibility to monitor, review, and become familiar with the questions and answers, as with all bid requirements and contract documents, prior to bidding. By signing the bid proposal and resulting contract, the bidder acknowledges receipt of, and agrees to the incorporation of the final list of Q and A, into the contract document.

Contractors will not be permitted to file a future claim based on lack of receipt, or knowledge of the questions and answers associated with a project. All bidding requirements and project information, including but not limited to contract plans, specifications, addenda, Q and A, Notice to Contractors, etc., are made public on the State Contracting Portal and/or the CTDOT website.

NOTICE TO CONTRACTOR – APJ BITUMINOUS CONCRETE PLACEMENT REQUIREMENTS

1. All the requirements of Special Provision Section 4.06 in the contract shall be met except as described below.
2. The first lift of HMA S0.375 inch bituminous concrete shall be placed at a compacted thickness of 1 ¼ inches. All other lifts of HMA S0.375 inch shall be placed at a compacted thickness of 1 ¼ to a maximum of 2 ½ inches. In lieu of density testing, the methods described below shall be followed to assure proper compaction.
3. The HMA S0.375 inch shall be delivered to the jobsite at Temperatures between 265 and 325°F. It shall be placed and spread in the prepared area with compaction commencing prior to the material cooling to a temperature of 240°F. When any bituminous concrete material is not able to be placed at 240 degrees or above it shall be properly discarded by the contractor at no cost to the State.
4. The bituminous concrete material shall be compacted in all areas, receiving the minimum number of passes required in Table A. All compaction (completing the minimum number of specified passes) shall be completed before the bituminous concrete cools to a temperature of 180°F. The contractor shall use the compaction equipment described below to complete the required number of passes.
5. All intermediate (non-surface) lifts shall be compacted with a vibratory plate compactor designed to compact hot mix asphalt.
 - a. The vibratory plate compactor shall meet the following requirements:
 - i. It shall be designed to compact bituminous concrete.
 - ii. It shall be equipped with a water tank.
 - iii. It shall generate a centrifugal force of at least 3200 pounds but no greater than 6000 pounds.
 - iv. It shall have an operating weight (without water) of at least 160 pounds.
 - v. It shall generate a minimum of 4400 vibrations per minute.
 - vi. Any corners or other areas that cannot be reached by the vibratory plate compactor shall be compacted with a hand tamper (approved for use by the Engineer) a minimum of 20 times (for any given area) before the material temperature drops to 180°F.
6. The final (surface) lift shall be compacted with a double drum roller.
 - a. The double drum roller shall meet the following requirements:
 - i. It shall be designed to compact hot mix asphalt.
 - ii. It shall weigh 3 ½ to 4 ½ tons

Table A

Lift thickness (in.)	Minimum Number of passes
1 ¼ to 1 ½	8
Greater than 1 ½ to 2	10
Greater than 2 to 2 ½	12

7. The contractor may request to use alternate equipment by submitting a request to the Engineer describing the change in methods or placement procedures. The equipment and procedures must be approved by the Engineer prior to their use.
8. If the work is not completed to the requirements described above, the work shall stop until such time that the Contractor can perform the compaction requirements described above.
9. Any work not completed to the requirements described shall not be paid for or shall be removed and redone to the requirements above at no additional cost to the State.

NOTICE TO CONTRACTOR – EXISTING IMS

The Contractor is herein made aware of existing Incident Management System (IMS) conduit and appurtenances located on I-84 EB and WB in the vicinity of the project area.

The Contractor will be responsible for locating, verifying the location of and protecting all IMS below and above the ground. Prior to the start of construction, the Contractor shall contact “Call Before You Dig” and all utility within the towns along the project corridor. The Contractor shall also contact Robert Kennedy (860-594-3458) or James Gannon (203-673-7373) of ConnDOT Highway Operations at to mark out IMS conduit and appurtenances.

In areas adjacent to existing incident management system equipment, the Contractor is required to hand excavate. Any damage caused to the IMS conduit/equipment will be the responsibility of the Contractor, and will be replaced by the Contractor at the Contractor’s expense, as directed by the Engineer. Mark out of the IMS will not relieve the Contractor of responsibility for repair of damage caused by the Contractor or the Contractor’s sub-contractors.

NOTICE TO CONTRACTOR – UTILITY COMPANIES

It is understood that any references in the contract documents to Northeast Utilities, CL&P and/or Yankee Gas are meant to refer to Eversource.

It is understood that any references in the contract documents to AT&T is meant to refer to Frontier Communications.

NOTICE TO CONTRACTOR – STANDARD SHEETS

The Contractor is hereby notified that Traffic Engineering's Standard Sheets pertaining to traffic signal equipment have been revised.

The contractor should note the changes on the following sheets:

TR-1107_01 – Included pedestrian button alignment diagrams & notes.

TR-1010_01 – Revised handhole notes, added note #6. Included "J" hook to insert detail.

TR-1111_01 – Removed urethane sealant note from detail "L".

TR-1111_02 – Removed entire sheet, details included in special provisions.

TR-1113_01 – Added Cable Closure for Traffic Signals, note #6.

TR-1114_01 – Added signal "Y" span attachment detail.

NOTICE TO CONTRACTOR – TRAFFIC SIGNALS

The Contractor is hereby notified that certain conditions pertaining to the installation of new signals and maintenance of traffic signal operations are required when relevant, as part of this contract.

Qualified/Unqualified Workers

U.S. Department of Labor

Occupational Safety & Health Administration (OSHA) www.osha.gov

Part Number 1910

Part Title Occupational Safety & Health Administration

Subpart S

Subpart Title Electrical

Standard Number 1910.333

Title Selection and use of work practices

Completion of this project will require Contractor employees to be near overhead utility lines. All workers and their activities when near utility lines shall comply with the above OSHA regulations. In general, unqualified workers are not allowed within 10 feet of overhead, energized lines. It is the contractor's responsibility to ensure that workers in this area are qualified in accordance with OSHA regulations.

The electric distribution company is responsible to provide and install all necessary anchors and guy strands on utility poles. It is the Contractors responsibility to coordinate with the utility company to ensure proper placement of the anchor.

The Controller Unit (CU) shall conform to the current edition of the Functional Specifications for Traffic Control Equipment. The Functional Specifications require the CU meet NEMA Standard Publication No. TS2-1992 Type 2. The Functional Specifications are available on the Departments' web site <http://www.ct.gov/dot/site/default.asp>, click on "Doing Business with CONNDOT", under Engineering Resources click on "Traffic Engineering", Scroll down to Traffic Documents click on "Functional_Specifications_for_Traffic_Control_Equip.pdf".

Utility poles cannot be double loaded without proper guying.

The contractor will be held liable for all damage to existing equipment resulting from his or his subcontractor's actions. A credit will be deducted from monies due the Contractor for all maintenance calls responded to by Department of Transportation personnel.

All existing traffic appurtenances, in particular steel span poles, controller cabinets and pedestals shall be removed from the proposed roadway prior to excavation. The Contractor shall work with the utility companies to either relocate or install all traffic signal appurtenances prior to the roadway reconstruction.

The Contractor must install permanent or temporary spans in conjunction with utility company relocations. He then must either install the new signal equipment and controller or relocate the existing equipment.

The 30 Day Test on traffic control equipment, as specified in Section 10.00, Article 10.00.10 - TESTS, will not begin until the items listed below are delivered to the Department of Transportation, Traffic Signal Lab in Rocky Hill.

Four (4) sets of cabinet wiring diagrams. Leave one set in the controller cabinet.
All spare load switches and flash relays.

NOTICE TO CONTRACTOR – SERVICE CONNECTIONS (UTILITIES)

The Contractor is hereby notified that certain conditions pertaining to the installation of new telephone service and/or electrical service for the Traffic Management System Cabinets (CCTV Cameras) is required, as part of this contract.

Unless otherwise approved by the Engineer, the responsibilities for utility services for the CCTV Cameras shall be as follows:

Power:

The Contractor shall supply the conduit, conduit riser and the power cable. The Contractor shall install 3 inch RMC Conduit with approved conduit covers and will install the power cable from the meter socket on the service cabinet to the base of the utility pole under Eversource supervision. Eversource will install the conduit riser and will pull the power cable through the conduit riser on the utility pole. Eversource to provide meter under the Install Service item. The Contractor shall contact the following representative 30 days prior to required work or services:

Eversource
Attn: Mr. Eric Lopes
Phone: (860) 280-2507
Email: eric.lopes@eversource.com

NOTICE TO CONTRACTOR – IMS INSTALLATION

The Contractor is alerted that no service interruption of the Incident Management System (IMS), resulting from the Contractors operations will be allowed. The existing IMS conduit system (junction boxes, conduit and fiber optic cable) are located along I-84 on-ramp, along I-84 EB shoulder, across Exit 63 off-ramp, on Route 30 Bridge (Bridge No. 05226), and along I-84 WB shoulder.

In order to maintain an uninterrupted service of the existing IMS infrastructure, the Contractor will re-route the existing IMS conduit and fiber optic cable from I-84 EB grass area to I-84 EB shoulder. The electric service conduit and electric service cable from the west side of the I-84 on ramp to the east side I-84 on ramp avoiding the future reconstruction of I-84 EB Exit 63.

New IMS Installation:

The Contractor shall install as much of the new IMS conduit and service conduit as practical to minimize the downtime of the existing Incident Management System (Camera 84E-3). The work associated with the new IMS conduit, electric service conduit, fiber optic cable, and electric service cable shall conform to the requirements of Notice to Contractor – Installation Qualifications and Section 1.08.04 Prosecution and Progress, Limitations of Operations - Incident Management System. The Contractor shall not begin the splicing operation of the fiber optic cable until the new IMS conduit, service conduit, fiber optic cable, and service cable is installed.

The work associated with the installation of the IMS conduit, electric service conduit, fiber optic cable and electric service cable includes the following:

Conduit and Fiber Cable Installation:

- Install new Service Cabinet and new Handhole 71.78
- Install 2” RMC Service Conduit from Service Cabinet to Handhole 71.78
- Install 2” RMC Service Conduit under roadway from Handhole 71.78 across I-84 on-ramp
- Install new Handhole 71.60
- Install 2” RMC under roadway from Handhole 71.72 to Handhole 71.60.

Final Conduit, Fiber Cable and Splicing Operation:

After the work described in “Conduit and Fiber Cable Installation” is complete, the Contractor shall notify the Department that they would like to schedule the “downtime” of the IMS fiber cable as described in the special provision “Notice to Contractor – Installation Qualifications”. The Contractor shall contact the Highway Operations Center at 860-594-3447 before the Contractor shall be permitted to disconnect the existing fiber optic cable for Camera 84E-3.

- During approved downtime, remove service cable and fiber optic branch cable.
- During approved downtime, install Handhole 71.76 and connect the two (2)- 2" RMC Service Conduits
- Clean existing electric service conduit as required from Camera 84E-3 Cabinet to Handhole 71.76
- Install Service conductors from Camera 84E-3 Cabinet to Service Cabinet- conductors shall be No. 3 single conductor, stranded copper, insulation Type XHHW and rated for 600 Volts
- During approved downtime, remove fiber optic cable from Existing Camera 84E-3 Cabinet to Pullbox 71.58
- Break into fiber optic conduit on Bridge No. 05226.
- Install new 2" RMC fiber conduit from break point in existing 2" RMC to Handhole 71.60
- Clean existing fiber optic conduit as required from Existing Camera 84E-3 Cabinet to existing Handhole 71.72 and from existing Pullbox 71.58 to new Handhole 71.60
- Install new fiber optic cable from Pullbox 71.58 to existing Camera 84E-3 Cabinet
- Splice 2 Fiber Branch cable for Camera 84E-3 to existing 60 fiber trunkline cable using Pullbox 71.58

* * * * *

The Contractor shall exercise extreme caution during all stages of the work. In the event of damage to the IMS system, the Contractor shall immediately notify the Engineer.

The Contractor is responsible for accurately locating the existing conduit carrying fiber optic cable as it is affected by his work. The Contractor shall contact Mr. James Gannon of Conn. DOT Highway Operations (203-673-7373) or Mr. Robert Kennedy of Conn. DOT Highway Operations (860-594-3458) at least forty-eight (48) hours prior to locating mainline fiber optic conduit.

The Contractor is hereby notified that hand digging may be required to accurately locate the existing IMS conduit. The Contractor shall also be responsible for maintaining and protecting the existing IMS conduit and trunk fiber optic cable at all times and during all phases of the Contractor's work operations.

The Contractor shall notify the Engineer prior to the start of his work and shall be responsible for all coordination with the Department. The Engineer shall be present during any work involving the conduit carrying fiber-optic cable. The Contractor shall allow the Engineer complete access to the work.

NOTICE TO CONTRACTOR – INSTALLATION QUALIFICATIONS

All management, construction, installation, and inspection services shall be performed by individuals who have performed the same job function on at least two previously completed construction and installation communication projects of comparable size and complexity.

Approval of ITS Equipment Installer:

Each Contractor or Subcontractor performing the work involved with the installation of Intelligent Transportation System (ITS) equipment related to the Incident Management System shall provide references and resumes of staff that shall meet the following requirements:

Satisfactory completion of at least three (3) projects in the last three (3) years that includes the installation of each of the ITS equipment identified below.

- 4in (100 mm) Multiduct Conduit
- Pullboxes
- Camera Lowering Devices
- Camera Assemblies
- Traffic Management System Cabinets (TMSC)
- Traffic Flow Monitors (TFM) and TFM Poles
- Variable Message Signs (VMS) and VMS Controller Cabinets

The Contractor shall provide a list of each ITS project which the Contractor has performed, including a description of each project, the location of each project, inclusive dates of when the work was performed on each project, and a contact reference for each project listed.

This document shall be submitted to ConnDOT for review and approval before any Incident Management System project work may proceed.

Approval of Fiber-Optic Cable Installation, Splicing and Testing:

Each Contractor or Subcontractor performing the work involved with installing, splicing and testing of cable and electronic communication systems and installing detection and video systems, shall provide references and resumes of staff that shall meet the following requirements:

Satisfactory completion of at least three (3) fiber-optic based communication projects in the last three years. Experience shall be in related fiber optic systems for installers involving single-mode cables in excess of 6 ¼ miles (10 kilometers).

The Contractor shall provide a list of each fiber-optic based communications project and/or intelligent transportation system project which the Contractor has performed, including a description of each project, the location of each project, inclusive dates of when the work was performed on each project, and a contact reference for each project listed. Each of the referenced projects shall include completing a minimum of three (3), multifiber, single-mode, optical fiber cable fusion splices, and installation of at least 25 optical connectors on single-mode optical fibers. As a minimum, the contact reference shall include an individual's name, training certificates (including updated licenses), title, and current telephone number.

This document shall be submitted to ConnDOT for review and approval before any Incident Management System project work may proceed.

Approval of ITS Systems Integrator:

The Prime Contractor or qualified proposed ITS Systems Integrator Subcontractor performing the work described in these Special Provisions which are involved with supplying, installing, configuring and testing of electronic communication systems and video systems for the Incident Management System, shall provide a printed document (nine copies) that contains the proposed ITS Systems Integrator's experience in the areas noted below, as well as references and resumes for staff proposed to perform the project work. The document should clearly indicate how the proposed ITS Systems Integrator meets the following requirements:

- Experience involving at least seven (7) ITS system integration projects with overall system responsibility and accountability, each employing at least 8 camera sites used for highway transportation purposes. A minimum of 7 years experience in ITS system integration.
- Design and installation of at least 200 point-to-point optical digital video links used for highway transportation purposes.
- A minimum of two (2) projects using video matrix switchers with a minimum size of 240 inputs and 64 outputs of analog video used for highway transportation purposes.
- Installation of video compression equipment involving at least ten sites, comprising video compression algorithms including but not limited to: H.261, MPEG1, MPEG2, MPEG4, and MJPEG used for highway transportation purposes.
- Experience using various applicable test equipment including: Fiber Optic Spectrum Analyzer, OTDR, BERT, Protocol Analyzer, and Oscilloscope.

- Installation of a minimum of 40 digital video encoder and decoder devices.
- Ability to respond within 2 hours travel by car to Central Office located at ConnDOT, 2800 Berlin Turnpike, Newington CT.
- Provision of 24x7x365 maintenance available with technicians fully trained in ITS related equipment.
- Demonstrate a general working knowledge of specifications RS-170 and RS-250C.
- Demonstrate a general working knowledge of communications protocols utilized in the CCTV industry.
- Demonstrate a general working knowledge of physical communications interfaces such as RS-232, RS-422, RS-485, RS-530, and RS-449.
- Demonstrate extensive working knowledge of Ethernet physical topologies TCP/IP routing schemes, metro ring and link aggregation protocols, VLAN configurations, and Quality of Service configuration and setup.

The document for the ITS Equipment Installer, Fiber-Optic Cable Installation, Splicing and Testing Qualifications and ITS Systems Integrator shall be submitted for approval within ten (10) days of the Contract Award to:

Mr. John F. Korte
Connecticut Department of Transportation
Bureau of Engineering and Highway Operations
2800 Berlin Turnpike P.O. Box 317456
Newington, Connecticut 06131-7546

These requirements shall apply to the following contract item installations:

- Optical Fiber Cable, Single Mode, Loose Buffered Tube Cable, 6-Fiber, 12-Fiber, and 72-Fiber
- Fiber Optic Cable Splice Closures
- Repair Fiber Optic Cable
- Traffic Management System Cabinets
- Traffic Management System Mini-Hub Cabinets
- Video equipment, including cameras and mountings
- Modify Existing Operations Center Control System

- Modify Existing Mini-hub Cabinet
- Optical Video/Data Transmitter and Receiver
- 10/100 Ethernet Switch
- Terminal Server
- Port Sharing Device
- Ethernet Media Converter
- Video and Graphics Wall Equipment
- Multi-Channel Fiber Optic Video Multiplexer/Demultiplexer
- Modify Existing Main Fiber Hub
- Single Mode Fiber Optic Directional Coupler
- Traffic Flow Monitor
- 10/100 Ethernet Router

The Contractor shall not start work on the Incident Management System until the Contractor receives approval from the Office of Highway Operations.

The Incident Management System shall be maintained in normal working operation at all times.

In the event that the Contractor needs to remove an Incident Management System device from service, the Contractor shall notify Mr. Robert Kennedy at the Newington Operations Center (860) 594-3458 at least ten (10) working days prior to any scheduled work operation. An Incident Management System device shall consist of CCTV cameras, camera cabinets, mini-hub cabinets, Traffic Flow Monitors, Variable Message Signs, Highway Advisory Radio site equipment and fiber optic cable including any associated fiber optic communications plant equipment.

All Project related scheduled work that will require the downtime of the Incident Management System, such as the splicing of the fiber optic trunkline cable, shall be performed as specified in Section 1.08 Prosecution and Progress - Incident Management System and as approved by Mr. Robert Kennedy, Newington Operations Center. The scheduled work performed on the approved non-holiday weekend shall be completed in an approved two (2) day (48 hour) window. The Contractor shall identify the work that will be performed during this work window as well as a list of the approved staff to be performing work on the Incident Management System. Any deviation from the approved two (2) day (48 hour) window must be approved by the Newington Operations Center staff.

Prior to the scheduled start of work on the Incident Management System, the Contractor shall contact the Bridgeport Operations Center to determine if there are any on-going incidents on the highway system. The Incident Management System will not be removed from service until any on-going incidents on the highway system are cleared and approval is granted by the Newington Operations Center staff.

All Contractor personnel involved in the placing, splice preparation and splicing of fiber optic cable shall meet or exceed the above referenced installation qualifications and shall be approved by the Office of Highway Operations. Under no circumstance will unqualified, unapproved Contractor personnel be allowed to work on the Incident Management System.

NOTICE TO CONTRACTOR – IMS ELECTRICAL SERVICES

Procedures regarding Incident Management System (IMS) electrical service installations, removals, inspections and inventory documentation:

1. The contractor shall make all arrangements with the utility company, complete the required service requests for all electrical service locations and keep a record of the service request tracking numbers (such as the Work Request No. from CL&P) provided by the utility company. All service requests shall include the six digit location number indicated on the plans. Billing for the monthly energy charges shall be to the following:

State of Connecticut Department of Transportation
P.O. Box 317546
Newington, CT 06131-7546

2. The contractor shall collect the applicable service information (service request tracking number, effective billing date, etc.) indicated on the IMS Service Log form contained herein for each IMS electrical service installation, and provide the information to the construction inspector. The construction inspector will forward the information to the Traffic Engineering Electrical Unit so that it will be entered into the IMS inventory log.
3. The construction inspector will contact the Property and Facilities - Code Inspection Services (P&FCIS) unit to schedule a code inspection for each IMS electrical service installation. The construction inspector will provide the P&FCIS unit a one (1) week notice prior to requiring them to perform an inspection. The construction inspector will provide P&FCIS with the service request tracking number for each electrical service in need of inspection.
4. The construction inspector will contact the Highway Operations unit to inform them when a new IMS system installation has been completed and is ready for their inspection.
5. When removing existing IMS systems, the contractor shall be required to notify the construction inspector 21 days in advance of required electrical service removal. The contractor shall provide the construction inspector with the applicable service information (meter number, meter address, service pole number, pole custodian, etc.) indicated on the IMS Service Log form. The construction inspector will forward the service information to the FDEE unit. The FDEE unit will prepare and submit a service removal request to the utility company to have the service de-energized and removed, and the service account terminated. The FDEE unit will inform the Traffic Engineering Electrical unit of the removal of the electrical service to have the IMS inventory log updated.

Office contacts and contact numbers:

Traffic Engineering Electrical unit – Diane Swinburne (860) 594-2799
Facilities Design Electrical Engineering (FDEE) – Zoltan Rigo (860) 594-2780
Property and Facilities Code Inspection Services (P&FCIS) – Michael LeBlanc (860) 594-2238
Highway Operations unit - John Korte (860) 594-3459

IMS Service Log,
To be filled out by the contractor.

Location: _____ Project No.: _____
Town: _____ Loc No.: _____
Route: _____

Service Request Tracking No.: _____
(provided by the power company)

Effective Billing Date: _____
(date power is connected & energized by the power company)

Removal Date: _____
(date power is disconnected & de-energized by the power company)

Meter No.: _____

Meter Address: _____

Pole No.: _____

Pole Custodian: _____

Date submitted to Construction Inspector: _____

Contractor Initials: _____

NOTICE TO CONTRACTOR – UNANTICIPATED DISCOVERY OF CULTURAL RESOURCES

If historic properties are unexpectedly encountered during Project construction, the contractor will immediately cease all construction activities in the immediate vicinity that may reasonably be assumed to affect the historic properties. Any historic property discoveries shall to the extent possible be protected in situ to allow for consultation among the Parties and the Tribes. The historic properties may be preserved in situ or mitigated on a case-by-case basis in consultation with the Parties and the Tribes. No artifacts are to be removed from the site unless approved by all parties. Notwithstanding anything to the contrary herein, the curation and disposition of any cultural resources shall be consistent with 36 C.F.R. Part 79 and other applicable law. If human remains are unexpectedly encountered during Project construction, the remains will be treated in a respectful manner and in accordance with the respective laws of the State of Connecticut (Connecticut General Statutes Chapter 184a Section 10-388) and State of Connecticut Department of Transportation, Supplement Form 816 January 2015 Abstract: Standard Specifications for Roads, <http://www.ct.gov/dot/cwp/view.asp?a=3609&q=430362>.

NOTICE TO CONTRACTOR – USE OF STATE POLICE OFFICERS

The Department will reimburse services of State Police Officers as a direct payment to the Department of Emergency Services and Public Protection. Payment for State Police Officers utilized by the Contractor for its convenience, not approved by the Engineer, is the responsibility of the Contractor. No separate payment item for State Police Officers is included in this contract.

Any costs associated with coordination and scheduling of State Police Officers will be included under the cost of Item No. 0971001A – Maintenance and Protection of Traffic.

NOTICE TO CONTRACTOR – VOLUNTARY PARTNERING

The Connecticut Department of Transportation (ConnDOT) intends to encourage the foundation of a cohesive partnership with the Contractor and its principal subcontractors on this project. This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance and completion within budget, on schedule, and in accordance with plans and specifications.

This partnership will be bilateral in makeup, and participation will be totally voluntary. Any cost associated with effectuating this partnering will be agreed to by both parties and will be shared equally.

To implement this partner initiative, the Contractor and ConnDOT will meet and plan a partnering development seminar/team building workshop. At this planning session arrangements will be made to determine attendees at the workshop, agenda of the workshop, duration and location. Persons required to be in attendance will be the ConnDOT District Engineer and key project personnel, the Contractor's on/site project manager and key supervision personnel of both the prime and principal subcontractors. The project design engineers and key local government personnel will also be required to have Regional/District and Corporate/State level managers on the project team.

Follow/up workshops will be held periodically throughout the duration of the Contract as agreed by the Contractor and ConnDOT.

The establishment of a partnership charter on a project will not change the legal relationship of the parties to the Contract nor relieve either party from any of the terms of the Contract.

ConnDOT and the Contractor will jointly select a facilitator to conduct the partnering workshops. The Contractor will obtain the services of the chosen facilitator and ConnDOT will reimburse the Contractor for fifty percent (50%) of the costs agreed to between ConnDOT and the Contractor.

NOTICE TO CONTRACTOR – GENERAL PERMIT FOR STORMWATER DISCHARGE

This notice is provided to summarize the requirements of the Connecticut Department of Energy and Environmental Protection's General Permit for the Discharge of Stormwater and Dewatering Wastewaters associated with Construction Activities (Permit) issued on April 9, 2010. When construction activities will result in the disturbance of a total of 1 acre (0.4047 ha) or more of land regardless of phasing, the Connecticut Department of Transportation (Department) will incorporate a Stormwater Registration (Registration) and Stormwater Pollution Control Plan (SWPCP) as part of the Contract documents in order to insure compliance with all conditions of this Permit. The Permit's 'Construction activities' means activities including but not limited to clearing and grubbing, grading, excavation, and dewatering.

The Registration and SWPCP addresses pollution caused by soil erosion and sedimentation during construction as well as the long term post-maintenance use of the facility after construction is completed. The Contractor and all subcontractors will be required to sign a certified statement to comply with all applicable conditions of the Registration and SWPCP. There will be no additional payment for the Contractor to sign the certification statement and no additional payment for the Contractor to comply with the conditions of the Registration and SWPCP.

The District Engineer is responsible to sign the Registration and will be the permittee for all Department construction projects. For all local town/municipal projects, the District Engineer is not responsible to sign the Registration as the local town or municipality will be the signed permittee.

If the Contractor requires a modification to the SWPCP, it shall be in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control and the 2004 Connecticut Stormwater Quality Manual or as revised or amended. The Department shall approve or reject the modification to the SWPCP and notify the Contractor in writing as to any revisions or additional information required for approval within 30 days of the date of the Contractor's submission. No damage for delays will be granted to the Contractor based on time taken by the Department to review the Contractor's proposal, or to apply for or secure the Permit amendment, modification or revision as per Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges, and Incidental Construction Form 816 and any Supplements thereto. At no time shall the Contractor proceed with the proposed Permit amendment, modification, or revision unless the Engineer approves, in writing, the Contractor's request.

At a minimum, the Contractor along with qualified personnel (provided by the permittee) shall inspect the site for non stabilized areas, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within twenty four hours of the end of a storm that is 0.1 inches (2.54 mm) or greater. If a potential source of pollution is identified, pollution preventive measures shall be implemented within twenty four hours and the SWPCP must be amended within three calendar days.

In order for the Contractor to meet the requirements set forth in the SWPCP, the Contractor shall comply with additional erosion and sedimentation control provisions included in the project.

Erosion and Sedimentation Control Provisions:

Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor is not allowed to disturb more than two (2) acres (0.8094 ha) of erodible material per discharge point at any one time regardless of phasing. If the Contractor elects to deviate from the Contract Plans and/or SWPCP to disturb more than two (2) acres (0.8094 ha) of erodible material per discharge point at any one time regardless of phasing, the Contractor must provide a sequenced staging plan outlining the proposed disturbed activities. In all cases, the Contractor must meet the following conditions:

- If the area of disturbance is maintained less than two (2) acres (0.8094 ha) per discharge point, the Contractor may disturb additional areas if and only if the previously disturbed areas are temporarily or permanently stabilized using acceptable measures such as the standard controls which are provided in the SWPCP or as shown on the Contract Plans.
- If the construction activities create an area of disturbance to be at least two (2) acres (0.8094 ha) per discharge point but no more than five (5) acres (2.0235 ha) per discharge point, the Contractor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sedimentation trap/temporary sedimentation basin per discharge point with a capacity to contain 134 cubic yards per acre (102.5 m³ per 0.4047 ha) of material. The Contractor shall design and construct the temporary sedimentation trap/temporary sedimentation basin in accordance with the 2002 Connecticut Guidelines for Soil and Sediment Control. The Contractor shall provide an inspection and maintenance plan for the temporary sedimentation trap/temporary sedimentation basin as part of the amended SWPCP.
- If the area of disturbance has a potential to reach more than five (5) acres (2.0235 ha) per discharge point, the Contractor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the engineered sedimentation basin per discharge point with a capacity to contain 134 cubic yards per acre (102.5 m³ per 0.4047 ha) of material. The Contractor shall design and construct the engineered sedimentation basin in accordance with the 2004 Connecticut Stormwater Quality Manual. The Contractor shall provide an inspection and maintenance plan for the engineered sedimentation basin as part of the amended SWPCP.

The permittee shall amend the SWPCP whenever there is a change in Contractors or subcontractors at the site, or a change in design, construction, operation, or maintenance at the site which has the potential for the discharge of pollutants. In all cases as described above, the amended SWPCP shall adhere to and comply with Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges and Incidental Construction Form 816 and any Supplements thereto. No additional payment will be made for any Permit amendment, modification, or revision which alters the Contract Plans, SWPCP, and/or estimated quantities as a result of the Department's approval of the modifications to the Contract by the Contractor. Changes or variations to the Contract Plans and/or SWPCP by the Contractor shall not result in any additional cost to the State.

NOTICE TO CONTRACTOR – SECTION 4.06 AND M.04 MIX DESIGNATION EQUIVALENCY AND PG BINDER EQUIVALENCY

Sections 4.06 and M.04 have been replaced in their entirety with the Special Provisions included as part of this contract. These Special Provisions reflect changes in mix designations for various types of hot-mix asphalt (HMA) and include the removal of mixes designed and governed by the Marshall Mix Design method. The following table is to be used to associate mix designations noted on the plans with those in the contract specifications and related documents. Mix designations on each row are equivalent and refer to a single mix, which shall be subject to the requirements of the Section 4.06 and M.04 Special Provisions for the Official Mix Designation in the leftmost column of the corresponding row in the table.

Mix Designation Equivalency Table

Official Mix Designation	Equivalent Mix Designation (a)	Equivalent Mix Designation (b)
(c)	Superpave 1.5 inch	Superpave 37.5 mm
HMA S1	Superpave 1.0 inch	Superpave 25.0 mm
HMA S0.5	Superpave 0.5 inch	Superpave 12.5 mm
HMA S0.375	Superpave 0.375 inch	Superpave 9.5 mm
HMA S0.25	Superpave 0.25 inch	Superpave 6.25 mm
(c)	Superpave #4	Superpave #4
HMA S0.5 (d)	Bituminous Concrete Class 1 (e)	Bituminous Concrete Class 1 (e)
HMA S0.375 (d)	Bituminous Concrete Class 2 where it is specified in lifts 1.25 or thicker (e)	Bituminous Concrete Class 2 where it is specified in lifts 1.25 or thicker (e)
HMA S0.25 (d)	Bituminous Concrete Class 2 where it is specified in lifts 1.0 inches to less than 1.25 inches (e); Bituminous Concrete Class 12 (e)	Bituminous Concrete Class 2 where it is specified in lifts 1.0 inches to less than 1.25 inches (e); Bituminous Concrete Class 12 (e)
HMA S1 (d)	Bituminous Concrete Class 4 (e)	Bituminous Concrete Class 4 (e)
Curb Mix	Bituminous Concrete Class 3	Bituminous Concrete Class 3

Notes

(a) This mix designation is generally included with projects where the English measurement system is used. The mix designation may contain both the English measurement system

designation and the SI (metric) measurement system designation, one of which would be in parenthesis.

(b) This mix designation is generally included with projects where the SI (metric) measurement system is used. The mix designation may contain both the English measurement system designation and the SI measurement system designation, one of which would be in parenthesis.

(c) This mix is no longer in use except by contract-specific Special Provision; if this mix is called for in the Plans but no such Special Provision is included for this contract a suitable substitute must be approved by the Engineer.

(d) Unless approved by the Engineer, the Superpave Design Level for the Official Mix Designation bituminous concrete replacing a Marshall mix called for in the plans or other contract documents shall be Design Level 2 for mixes used on mainline or shoulders of state-maintained roadways and Design Level 1 elsewhere, including but not limited to driveways or sidewalks.

(e) All mixes designed under the Marshall mix-design method are no longer covered by the 4.06 Special Provision. Wherever they appear in Contract plans and documents they shall be substituted by the “Official Mix Designation” in the same row of the Mix Designation Equivalency Table. Unless approved by the Engineer, the Superpave Design Level shall be Level 1.

PG Binder Designation Equivalency Table

Official Binder Designation	Equivalent Binder Designation	Use
PG 64S-22	PG 64-22	Hot-Mix Asphalt (HMA S* pay items and pay items using HMA S* materials)(a),(b)
PG 64E-22	PG 76-22	Polymer-Modified Asphalt (PMA S* pay items and pay items using HMA S* materials)(a),(b)

Notes

- (a) Use the Mix Designation Equivalency Table above to identify the Official Mix Designation for materials using the Marshall mix design method, i.e. “Bituminous Concrete Class *.”
- (b) Refer to the NTC – Superpave Design Level for the Superpave Design Level to use for each mix on a project. The PG Binder Designation Equivalency Table can be used to obtain the Official Binder Designation for each mix identified in the NTC – Superpave Design Level.

NOTICE TO CONTRACTOR – SUPERPAVE DESIGN LEVEL INFORMATION

Hot-Mix Asphalt (HMA) and Polymer-Modified Asphalt (PMA) constructed according to the Superpave mix-design system are required to attain a Superpave Design Level and are required to use a Performance Graded (PG) binder. The Superpave Design Levels required for this project are listed in Table 1. The required PG binder is indicated for each mix with an “X” in the appropriate box in Table 1.

TABLE 1 – Superpave Design Level and Performance Graded (PG) Binder

Mix Designation	PG Binder		Route 30	Route 83	I-84 On-Ramp	I-84 Off-Ramp	Bridge #5234 and #5238
	PG 64S-22	PG 64E-22	Design Level	Design Level	Design Level	Design Level	Design Level
HMA S0.25	-	-	-	-	-	-	-
HMA S0.375	-	-	-	-	-	-	-
HMA S0.5	-	-	-	-	-	-	-
HMA S1	-	-	-	-	-	-	-
PMA S0.25	-	X	-	-	2	-	2
PMA S0.375	-	-	-	-	-	-	-
PMA S0.5	-	X	3	2	2	2	2
PMA S1	-	X	3	2	2	2	-

Note: Please note that PMA mix designations typically use PG 64E-22 and HMA mix designations use PG 64S-22

NOTICE TO CONTRACTOR – CLEANING DRAINAGE

The Contractor shall clean all new and existing drainage structures and storm drains including all inlets, outlets, and scour holes. This work is to be performed at the completion of the project to insure proper functionality of the storm drainage system or as directed by the Engineer.

There will be no direct payment made for this work, but the cost shall be included in the contract lump sum for “Clearing and Grubbing”.

NOTICE TO CONTRACTOR – SALVAGE

The contractor shall salvage the following items for the State:

Catch Basin Tops found in good, reusable condition.

And

Metal Beam Rail found in good, reusable condition.

And

Bridge Rail from bridge no. 05234

Elements in good, reusable condition shall be banded. (Elements will not be accepted if not properly banded.) Elements with damage will not be accepted.

The State Inspector responsible for this project shall determine the condition of the materials.

The salvaged Catch Basin tops shall be delivered by the Contractor to Jamie Willis, CTDOT Vernon Maintenance, 860-875-4993.

The salvaged Metal Beam Rail shall be delivered by the Contractor to Luis Crespo, CTDOT East Hartford Maintenance, 860-569-0070.

The salvaged Bridge Rail shall be delivered by the Contractor to Eric Belanger, CTDOT Hartford Bridge Maintenance, 860-566-3102

The salvaged material shall be loaded, transported and unloaded by the Contractor. All material shall be stacked and stored by the Contractor according to the direction of the General Supervisor or his/her representative.

The contractor shall not receive direct payment for this work. The cost of dismantling, sorting, banding, loading, transporting and unloading the items designated for salvage shall be included in the general cost of the work for the project.

NOTICE TO CONTRACTOR – COORDINATION WITH EXISTING UTILITY COMPANIES

General :

Utility relocation work, by others, is required within the project limits. The Contractor shall schedule his operations in such a manner as to minimize interference with utility relocation/protection activities. There are utility relocations for both aerial and underground utilities. The proposed relocations are shown on the utility plans for information purposes only and are subject to change.

As required by State Law, the Contractor shall contact "Call Before You Dig". Telephone 1-800-922-4455 for the location of public utility underground facilities in accordance with Section 16-345 of the Regulations of the Department of Public Utility Control. The underground activities should be clearly delineated within all areas of proposed excavation prior to performing actual excavation. The notification to "Call Before You Dig" must be made at least 48 hours in advance.

Contractors are cautioned that it is their responsibility to verify locations, conditions and field dimensions of all existing features, as actual conditions may differ from information shown on the plans or continued elsewhere in the specifications.

Prior to the setting of utility poles, the Contractor shall place fill or excavate to within 6 inches of finished grade, as required, in the areas where the utility poles are to be relocated.

The Contractor shall consider in their bid any inconvenience and work required to meet these conditions. The work to repair or replace any damage to utilities caused by the Contractor's operations will be solely at the Contractor's expense, in accordance with Form 816, Section 1.07.

In the areas where the proposed drainage is to be located, the Contractor is advised to use extra precaution where this drainage passes near the existing utilities. The Contractor will be responsible for providing temporary and permanent supports in these areas. Exposure and undermining is required to be kept at a minimum. No additional compensation will be made for delays or inconvenience sustained by the Contractor due to the protection of these utilities.

The Contractor shall notify the Engineer prior to the start of his work and shall be responsible for all coordination with the Department. The Contractor shall allow the Engineer complete access to the work.


The Contractor is hereby notified that the utility work schedules will have to be accommodated prior to proceeding. The Contractor shall coordinate with the utility companies to accommodate his schedule with all utility company schedules. Any inconvenience or delay that may result from the utility company work shall be included in the contract bid for the work.

The contractor should be advised that he will be required to coordinate with Eversource electric's new service department for the relocation of an existing meter located within the project limits at the northeast corner of intersection of routes 30 & 83. Further information will be available at the preconstruction meeting once project is awarded.

The Contractor shall notify the following utility company representatives a minimum of two (2) weeks prior to the start of the road construction work that could affect their utilities:

The Connecticut Light and Power Company dba Eversource Energy - Electric Distribution

Mr. Edward Schneider,
Engineering Manager - System Projects
107 Selden Street
Berlin, CT 06037
PHONE: (860) 665-3686 EXT: Mobile: (860) 685-0453
E-MAIL: edward.schneider@eversource.com



Connecticut Natural Gas Corporation, Engineering Department

Mr. Vasant C. Patel,
Manager - Utility Coordination
76 Meadow Street, 1st Floor
East Hartford, CT 06108
PHONE: (860) 727-3114 EXT: Mobile:
E-MAIL: vpatel@ctgcorp.com




The Southern New England Telephone Company dba Frontier Communications of Connecticut

Mr. Eric Clark,
Construction Manager - Statewide Structure Access
1441 North Colony Road
Meriden, CT 06450-1979
PHONE: (203) 238-7407 EXT: Mobile:
E-MAIL: erc532@ftr.com



Fiber Technologies Networks, LLC

Ms. Beth Bannister,
Construction Manager - CT
1781 Highland Avenue, Suite 102
Cheshire, CT 06410
PHONE: (860) 432-4240 EXT: Mobile: (585) 409-6006
E-MAIL: bbannister@fibertech.com




CoxCom, Inc.

Mr. Thomas Derway,
Capital/Utility Coordinator
801 Parker Street
Manchester, CT 06045

PHONE: (860) 432-5040 EXT:

E-MAIL: thomas.derway@cox.com

Mobile:




Town of Manchester, Department of Public Works

Mr. Mark Carlino,
Director of Public Works
494 Main Street, P.O. Box 191
Manchester, CT 06045-0191

PHONE: (860) 647-3067 EXT:

E-MAIL: mcarlino@manchesterct.gov

Mobile:



NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE

The attached project specific utility work schedule was provided to the Connecticut Department of Transportation (Department) by the utility companies regarding their identified work on this project.

The utility scheduling information is provided to assist the Contractor in scheduling its activities. However, the Department does not ensure its accuracy and Section 1.05.06 of the Standard Specifications still is in force.

The utility scheduling information shall be incorporated into the Contractor's pre-award schedule in accordance with the Department's Bidding and Award Manual and Section 1.05.08 of the Contract.

After award, the Contractor shall conduct a utility coordination meeting or meetings to obtain contemporaneous scheduling information from the utilities prior to submitting its baseline schedule to the Department in accordance with Section (**1.05.08 – Schedules and Reports**) of the Contract.

The Contractor shall incorporate the contemporaneous utility scheduling information into its baseline schedule submittal. The baseline schedule shall include Contractor predecessor and successor activities to the utility work in such detail as acceptable to the Engineer.

rev. 5/20/2013		UTILITY WORK SCHEDULE	
CTDOT Project Number: 76-193		Town: Manchester	
Project Description: Intersection Improvements Rt 30 & 83			
CTDOT Utilities Engineer: Kurt Von Hone			
Phone: (860)594-3267		Email: Kurt.VonHone@ct.gov	
Utility Company: Connecticut Light and Power Company			
Prepared By: John Remkiewicz		Date Prepared: 1/7/2015	
Phone: 860-280-2497		Email: john.remkiewicz@nu.com	
Scope of Work			
The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.			
PERMANENT POLE RELOCATIONS: Rt 30 Manchester Replace pole 7987 and pole 8580. Adjust the location of pole 8580 to accommodate the new traffic signal mast arm at the intersection of RT 83 and RT 30.			
Special Considerations and Constraints			
The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc.			
Core bore drilling may be required if ledge is encountered Primary circuit outage may be required			

UTILITY WORK SCHEDULE			
CTDOT Project Number: 76-193			
Utility Company: Connecticut Light and Power Company			
Prepared By: John Remkiewicz		Total Calendar Days: 3	
Schedule			
<p>The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.</p>			
Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
	PERMANENT POLE RELOCATIONS		
110+60 to 120+35	Install 2 poles and anchors when within 1 foot of final grade	Clearing, grubbing, fill / cuts completed by state contractor	1
110+60 to 120+35	Frame poles and shift OH conductors.	Poles have been set	1
110+60 to 120+35	Communications begin shift work	Electric Co. completes work	?
110+60 to 120+35	Removal of pole butts	Communications complete work	1

rev. 5/20/2013

UTILITY WORK SCHEDULE

CTDOT Project Number: SP 76-193

Town: Manchester

Project Description: RT 30 & 83 (Tolland Tpke) at RT 83 (Oakland St.) and the I-84 ramps.

CTDOT Utilities Engineer:

Phone:

Email:

Utility Company: Cox Communications

Prepared By: Tom Derway

Date Prepared: 3/13/2015

Phone: (860) 432-5040

Email: Thomas.Derway@Cox.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

Cox will try to transfer the existing cables to new poles. If not will rebuild strand from pole #7986 to pole #7987 on Tolland Tpke. Delash existing fiber from the existing strand to pole #7988. Cox will install two spans of .875 with a straight splice at pole #7987. Install .625 coax to pole #7988. Night cut would be required. Splice and activate all new coax. Relash existing fiber to the strand. Wreck out all old strand and coax.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

Eversource has to install the new poles, complete their build and top the old poles before Cox can start any work.

UTILITY WORK SCHEDULE				
CTDOT Project Number: SP 76-193				
Utility Company: Cox Communications				
Prepared By: Tom Derway		Total Calendar Days: 5		
Schedule				
<p>The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.</p>				
Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)	
109 + 00 to 115 + 00	Cox transfer to new pole #8580 and #7987 if possible.	Eversource needs to install new poles and complete their work.	1	
109 + 00 to 115 + 00	If needed Cox will install new strand between poles #7986 and 7987.		1	
109 + 00 to 115 + 00	Delash existing fiber between #7986 to #7988.		0.5	
109 + 00 to 115 + 00	Install a new piece of .625 from 7986 to 7988 and one piece of .875 from 7986 to 8580.		0.5	
109 + 00 to 115 + 00	NIGHT SPLICE - Activte new coax.		1	
109 + 00 to 115 + 00	Relash fiber the new strand.		0.5	
109 + 00 to 115 + 00	Wreck out old strand and coax.		0.5	

UTILITY WORK SCHEDULE Rev 3/2015	
CTDOT Project Number:	76-193
Town:	Manchester
Project Description: Improvements on I-84 Exit 63 Off-Ramp & Intersection of Routes 30 & 83	
CTDOT Utilities Engineer:	Kurt vonHone
Phone: (860) 594-3267	Email: kurt.vonhone@ct.gov
Utility Company: Town of Manchester Water & Sewer Dept.	
Prepared By: Ray Myette	Date Prepared: 6/22/2015
Phone: (860) 647-3220	Email: rmyette@manchesterct.gov
<p align="center">Scope of Work</p> <p>The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.</p> <p>Replacement of fire hydrant on Route 30 from STA 111+10 LT (Offset = 43.0) to STA 111+10 LT (Offset = 51.5), outside of the proposed roadway, and to avoid conflict with existing 8" gas main.</p>	
<p align="center">Special Considerations and Constraints</p> <p>The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..</p>	

CTDOT Project Number:	76-193
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Utility Company:	Town of Manchester Water & Sewer Department
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Prepared By: Ray Myette

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of working days required to complete the utility work activity based on historical information and production rates.

[illegible]

**NOTICE TO CONTRACTOR – GLOBAL POSITIONING SYSTEM (GPS)
COORDINATES FOR SIGNS**

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new signs. The Engineer shall forward the sign data to the Division of Traffic Engineering for upload into the Highway Sign Inventory and Maintenance Management Program (SIMS). Contact Mr. Philip J. Cohen at (860) 594-2744 of the Division of Traffic Engineering regarding any SIMS questions. Contact Mr. James R. Spencer at (860) 594-2014 of the Department's Bureau of Policy and Planning regarding any GPS questions. Refer to the special provision for Section 12.00 General Clauses For Highway Signing.

SECTION 1.02 – PROPOSAL REQUIREMENTS AND CONDITIONS

Article 1.02.04 – Examination of Plans, Specifications, Special Provisions and Site of Work:

Replace the third sentence of the last paragraph with:

The Department cannot ensure a response to inquiries received later than ten (10) days prior to the original scheduled opening of the related bid.

SECTION 1.05 – CONTROL OF THE WORK

Article 1.05.02 - Plans, Working Drawings and Shop Drawings
is supplemented as follows:

Subarticle 1.05.02 - (2) is supplemented by the following:

Traffic Signal Items:

When required by the contract documents or when ordered by the Engineer, The Contractor shall prepare and submit product data sheets, working drawings and/or shop drawings for all traffic signal items, except Steel Span Poles and Mast Arm Assemblies when applicable, to the Division of Traffic Engineering for approval before fabrication. The packaged set of product data sheets, working drawings and/or shop drawings shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf). The package submitted in paper form shall include one (1) set. Product data sheets shall be printed on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please mail to:

Lisa N. Conroy, P.E.
Transportation Supervising Engineer
Connecticut Department of Transportation
Division of Traffic Engineering – Electrical
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546
(860) 594-2985

The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file with appropriate bookmarks for each item. The electronic files for product data sheets shall be created on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be created on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please send the pdf documents via email to:

<mailto:lisa.conroy@ct.gov>

Steel Span Poles and Mast Arm Assemblies:

When these items are included in the project, the submission for Steel Span Poles and Mast Arm Assemblies shall follow the format and be sent to the "Engineer of Record" as described in the Steel Span Pole and Steel Mast Arm Assembly special provision.

Illumination Items:

The packaged set of product data sheets, working drawings and/or shop drawings shall be submitted in an electronic portable document format (.pdf). All approvals or disapprovals and comments will be returned in one package.

The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file with appropriate bookmarks for each item. The electronic files for shop drawings shall be created on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets.

Please send the pdf documents via email to:

<mailto:jon.andrews@ct.gov>

Incident Management System Items:

When required by the contract documents or when ordered by the Engineer, the Contractor shall prepare and submit product data sheets, working drawings and/or shop drawings for all Incident Management System (IMS) related items to the Bureau of Highway Operations for approval before fabrication. IMS related items include multiduct conduit, pullboxes, fiber optic and communications cables, cabinets, cameras, camera lowering devices, variable message signs (VMS), traffic flow monitors (TFM) and telecommunications related equipment.

The packaged set of product data sheets, working drawings and/or shop drawings shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf). The package submitted in paper form shall include one (1) set. Product data sheets shall be printed on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please mail to:

Mr. John F. Korte
Connecticut Department of Transportation
Bureau of Highway Operations
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

Please send the pdf documents via email to:

<mailto:john.Korte@ct.gov>

SECTION 1.06 – CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality:

Add the following:

Traffic Signal Items:

For the following traffic signal items the contractor shall submit a complete description of the item, working drawings, product data sheets and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for. All documents shall be submitted at one time, unless otherwise approved by the engineer.

Aluminum Pedestals	Optical Pre-Emption Equipment
Traffic Signal Housings and Hardware	Phase Selector
Pedestrian Signals Housing and Hardware	Detector (Type)
Accessible Pedestrian Signal & Detector	Pre-Emption System Chassis
Traffic Signal Controller Unit	Detector Cable (Optical)
Traffic Controller Cabinet	Video Vehicle Detection
Controller Unit	Camera Assembly
Solid State Time Switch	Camera Extension Bracket
Solid State Load Switch	Video Detector Processor
Conflict Monitor	Camera Cable
Solid State Flasher	Monitor
Flash Transfer Relay	Cable Closure
	Auxiliary Equipment Cabinet

Illumination Items:

For the following materials the Contractor shall submit a complete description of the item consisting of the latest manufacturer shop drawing(s) which completely illustrates the material presented for formal approval. The submitted shop drawing(s) shall clearly call-out all material and operational properties for the item specific to the project. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for.

Light Standards	Precast Foundation
Conductors	Service Items
Luminaires	Temporary Illumination Unit
Conduit	Aerial Cable
Cable in Duct	Handhole
Fuses and Fuse Holders	Junction Box

Required shop drawings for all items listed above shall be submitted in one package at the same time. Please note: the list of items above is a “general” list of items. Certain items listed may or may not be present in a specific project. Please consult the Detailed Estimate sheet for project specific items.

Incident Management System Items:

For the following items required for the Incident Management System, the Contractor shall submit a complete description of the item, together with either in paper (hard copy) form or in an electronic portable document format (.pdf) one (1) copy of shop drawings, product data sheets and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report, and materials certificate as may be called for.

Approval of the Shop Drawings and product data sheets shall not change the requirements for a certified test report, materials certificate and certificate of compliance as may be called for.

Shop drawings shall be submitted on 8-1/2 inch by 11 inch sheets, 11 inch by 17 inch sheets or on 24 inch by 36 inch standard plan sheets. Shop drawings and data sheets shall be required for, but not limited to the following

Structural supports	Conductors
Hand holes and covers	Fiber Optic Cable
Pullboxes and pullbox covers	Fiber Patch Cords
Fiber Optic Modems	Fiber Optic Connectors
Camera power supply	Fiber Optic Splice Enclosures
Traffic Flow Monitors	Optical Fiber Termination Patch Panels
Cast Iron Handhole Cover	Optical Video/Data Transmitter
Cast Iron Junction Box	Optical Video/Data Receiver
Fiberglass Junction Box	Network Customer Service Unit
Traffic Management System Cabinets	Video encoders and de-coders
Traffic Management System Mini-hub Cabinets	Surge Panels
Auxiliary Termination Cabinets	Ethernet switch
Transformers	Ethernet Port Sharing Device
Steel CCTV Poles	Cat 6 Cable
Camera Lowering Device Assembly	CCTV Coax Cable
Remote Control Flashing Lights	Coax Cable Connectors
Service Cabinets	CCTV Twisted Pair cable
Meter Sockets	CCTV Twisted pair connectors
Surface Mounted Conduit and Appurtenances	RJ 45 and RJ 48 Connectors
Conduit, pulling tape, supports, brackets, hangers, clamps and any hardware involved with the supports and including complete fabrication details.	
Field fastener details including chemical and mechanical anchors	
Camera Assembly. Schematics of the wiring between the camera and the equipment cabinet shall also be provided.	
Camera Video Cables, Data Cables, Power Cables and Connectors	
Modify Existing Operations Center Control System including all materials, schematics, diagrams and drawings.	
Motorists Aid Variable Message Signs, cabinets, cables, diagrams, schematics etc.	

Article 1.06.05 - Shipping Materials: Add the following:

Incident Management System Items:

All vehicles transporting materials on highways and bridges in the State shall comply with all the vehicle regulations of the Connecticut General Statutes and regulations of Connecticut State Agencies as they apply to vehicle length, width, height and weight.

Any vehicle, either loaded or unloaded, will not be allowed to travel across any bridge or on any highway when such vehicle exceeds the legal limits or posted limits of such bridge or highway without a permit. The owner of the vehicle must apply to the Department for a permit for such travel, as provided in the statutes.

The General Statutes include the following limitations:

Vehicle Width (Section 14-262(a)(1)) - The width of a vehicle and combination vehicle and trailer, including its load, is limited to 8.5 ft. (2,590 mm), without a permit.

Vehicle Length (Section 14-262(c)) - The length of the semitrailer portion of a tractor-trailer unit, including its load, is limited to 48 ft. (14,630 mm), without a permit.

Vehicle Height (Section 14-264) - The height of a vehicle, with its load, is limited to 13.5 ft. (4,110 mm), without a permit.

Vehicle Weight (Section 14-267a(b)(7)) - The gross vehicle weight (weight of vehicle including its load) is limited to 80,000 lbs. (36,280 kg) on 5 axles for vehicles with a 51 ft. (15,540 mm) wheelbase, without a permit.

Axle Weights of Vehicles (Section 14-267a) – For the above five axle vehicle, weight on a single axle may not exceed 22,400 lbs. (10,160 kg) or in the case of axles spaced less than 6 ft. (1,828 mm) apart, 18,000 lbs. (8,160 kg).

On Department projects, in accordance with the Commissioner's policy, any member or component, either temporary or permanent, that measures 120 ft. (36,570 mm) or less and weighs no greater than 120,000 lbs. (54,430 kg), is transportable via an authorized permit route established by the Department provided the individual axle weights on the vehicle and trailer transporting the member or component do not exceed 20,000 lbs. (9,070 kg).

Members and components, shown in the contract documents, that exceed the above length and weight limits have been reviewed by the Department's Oversize and Overweight Permits Section and are transportable via an authorized permit route established by the Department provided the individual axle weights on the vehicle and trailer transporting the member or component do not exceed 20,000 lbs. (9,070 kg).

All permits to transport materials are subject to shipping times established by the Department's Oversize and Overweight Permits Section.

Applications for permits, required to transport materials, shall be submitted a minimum of two weeks prior to their required use, to the Department's Oversize and Overweight Permits Sections.

Article 1.06.07 - Certified Test Reports and Materials Certificate.

Add the following:

Traffic Signal Items:

- 1) For the materials in the following Traffic Signal items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

Steel Span Pole Anchor Bolts
Steel Span Poles

- 2) For the materials in the following Traffic Signal items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Aluminum Pedestals
Steel Span Poles
Traffic Signal Housings and Hardware
Pedestrian Signals Housing and Hardware
Accessible Pedestrian Signal & Detector
Traffic Signal Controller Unit
Traffic Controller Cabinet
Controller Unit
Solid State Time Switch
Solid State Load Switch
Conflict Monitor
Solid State Flasher
Flash Transfer Relay

Optical Pre-Emption Equipment
Phase Selector
Detector (Type)
Pre-Emption System Chassis
Detector Cable (Optical)
Video Vehicle Detection
Camera Assembly
Camera Extension Bracket
Video Detector Processor
Camera Cable
Monitor
Cable Closure
Auxiliary Equipment Cabinet

Illumination Items:

- 1) For the materials in the following Illumination items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

Light Standards

Anchor Bolts

- 2) For the materials in the following Illumination items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Light Standards
Conductors
Cable in Duct

Luminaires
Anchor Bolts

Incident Management System (IMS) Items:

- 1) For the materials in the following Incident Management System items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Structural Steel	Rigid Metal Conduit
(Poles and Sign Supports)	Anchor Bolts
Structural Tubing	Conduit hangers, supports, clamps
Galvanizing	Handholes
(certifying compliance with ASTM)	Cast Iron Junction Box
Zinc Rich Primer	Pull Box
Neoprene Gasket	Pull Box Cover
Polyurethane Sealant	Lowering Device Assembly
Grounding Rods	Fiber Optic Cable
Copper Wire	Fiber Optic Cable Connectors

- 2) For the materials in the following Incident Management System items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

Anchor Bolt and Hardware	Service Cabinet
Structural Steel	Transformer
(Poles and Sign Supports)	Camera Cables
Structural Tubing	Structural Steel (Poles)
Welds	Fiber Optic Cable
Conduit	Fiber Optic Cable Connectors

SECTION 1.07 – LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.10 - Contractor's Duty to Indemnify the State against Claims for Injury or Damage:

Add the following after the only paragraph:

“It is further understood and agreed by the parties hereto, that the Contractor shall not use the defense of Sovereign Immunity in the adjustment of claims or in the defense of any suit, including any suit between the State and the Contractor, unless requested to do so by the State.”

Article 1.07.11 - Opening of Section of project to Traffic or Occupancy:

Add the following sentence to the last paragraph;

“In cases in which guiderail is damaged by the traveling public, repair or replacement will be reimbursable as contained elsewhere herein.”

Article 1.07.13 - Contractor's Responsibility for Adjacent Property, Facilities and Services is supplemented as follows:

The following company and representative shall be contacted by the Contractor to coordinate the protection of their utilities on this project 30 days prior to the start of any work on this project involving their utilities:

Mr. Augusto Grazuna
District 1 Electrical Supervisor
Department of Transportation
Hartford, Connecticut
860-566-3156/3157

Ms. Beth Bannister
Construction Manager – CT
Fiber Technologies, LLC
(860) 432-4240
bbannister@fibertech.com

Mr. Vasant C. Patel
Manager-Utility Coordination
CT Natural Gas Corporation
860-727-3114
vpatel@ctgcorp.com

Mr. Wayne D. Gagnon
Engineering Manager-System Projects
Eversource Energy
860-665-2473
Wayne.gagnon@eversource.com

Mr. Tom Derway
Capital/Utility coordinator
CoxCom, Inc.
(860) 423-5040
Thomas.derway@cox.com

Mr. Eric Clark
Construction Manager
Frontier Communications
203-238-7407
Erc532@ftr.com

Mr. Raymond Myette, Jr
Engineering Division
Town of Manchester
860-647-3220
rmyette@ci.manchester.ct.us

The following Department representative shall be contacted by the Contractor to coordinate an inspection of the service entrance into the controller/flasher cabinet for controllers within the State right-of-way, when ready for inspection, release, and connection of electrical service. The local Building Department shall be contacted for electrical service inspections for controllers located on Town roads located within the respective municipality.

Mr. Michael LeBlanc
Property & Facilities
Department of Transportation
Newington, CT 06111
860-594-2238
Cell 860-983-5114

Please provide the electrical service request number provided by the power company. This is a Work Request (WR) Number provided by Eversource (formerly Northeast Utilities [CL&P]) or a Work Order Number provided by United Illuminating (UI). For State-owned traffic signals in Eversource territory, contact the Department's Traffic Electrical Unit to obtain the WR Number.

SECTION 1.08 – PROSECUTION AND PROGRESS

Article 1.08.03 - Prosecution of Work:

Add the following:

The Contractor will not be allowed to install traffic signal or pedestrian heads until the controllers are on hand and ready for installation. Once installation of this equipment commences, the Contractor shall complete this work in a most expeditious manner.

The Contractor shall notify the project engineer on construction projects, or the district permit agent on permit jobs, when all traffic signal work is completed. This will include all work at signalized intersections including loop replacements, adjusting existing traffic signals or any relocation work including handholes. The project engineer or district permit agent will notify the Division of Traffic Engineering to coordinate a field inspection of all work.

Article 1.08.04 - Limitation of Operations - Add the following:

In order to provide for traffic operations as outlined in the Special Provision "Maintenance and Protection of Traffic," the Contractor will not be permitted to perform any work which will interfere with the described traffic operations on all project roadways as follows:

Holiday Restrictions (All Roadways)

On the following State observed Legal Holidays:

New Year's Day
Good Friday, Easter*
Memorial Day
Independence Day
Labor Day
Thanksgiving Day**
Christmas Day***

The following restrictions also apply:

On the day before and the day after any of the above Legal Holidays.

On the Friday, Saturday, and Sunday immediately preceding any of the above Holidays celebrated on a Monday.

On the Saturday, Sunday, and Monday immediately following any of the above Holidays celebrated on a Friday.

* From 6:00 a.m. the Thursday before the Holiday to 8:00 p.m. the Monday after the Holiday.

** From 6:00 a.m. the Wednesday before the Holiday to 8:00 p.m. the Monday after the Holiday.

***From 6:00 a.m. to 9:00 p.m. on the Saturday and Sunday immediately preceding the Holiday.

Route I-84

During all other times:

The Contractor shall maintain and protect traffic as shown on the accompanying "Limitation of Operations" charts, which dictate the minimum number of lanes that must remain open for each day of the week.

The Contractor will be allowed to halt Route I-84 traffic for a period not to exceed 10 minutes to perform necessary work for the erection, removal, and setting of structural steel and for the removal of the existing bridge superstructure, as approved by the Engineer, between 12:01 a.m. and 5:00 a.m. on all non-Holiday days.

Limitation of Operations Chart
Minimum Number of Lanes to Remain Open

Route: 84 EB Location: Exit 63 – Manchester Number of Through Lanes: 3							
Hour Beginn- ing	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	2	2	2	2	2	2	2
1 AM	2	2	2	2	2	2	2
2 AM	2	2	2	2	2	2	2
3 AM	2	2	2	2	2	2	2
4 AM	2	2	2	2	2	2	2
5 AM	2	2	2	2	2	2	2
6 AM	E	E	E	E	E	2	2
7 AM	E	E	E	E	E	2	2
8 AM	E	E	E	E	E	2	2
9 AM	2	2	2	2	3	3	2
10 AM	2	2	2	2	3	3	3
11 AM	3	3	3	2	3	3	3
Noon	3	3	3	3	3	3	3
1 PM	3	3	3	3	3	3	3
2 PM	3	3	3	3	3	3	3
3 PM	E	E	E	E	E	3	3
4 PM	E	E	E	E	E	3	3
5 PM	E	E	E	E	E	3	3
6 PM	E	E	E	E	E	3	3
7 PM	2	2	3	2	3	2	3
8 PM	2	2	2	2	3	2	3
9 PM	2	2	2	2	2	2	2
10 PM	2	2	2	2	2	2	2
11 PM	2	2	2	2	2	2	2

On Holidays and within Holiday Periods, all Hours shall be ‘E.’

‘E’ = maintain existing traffic operations = all available travel lanes, including exit only lanes, climbing lanes and all available shoulder widths shall be open to traffic during this period

Route I-84 Ramps

During all other times:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 7:00 p.m.

The Contractor will also be allowed to temporarily close the I-84 Eastbound Exit 63 on and off-ramps and detour traffic as shown on the detour plans within the contract plans. The closures may only be implemented between 7:00 p.m. and 6:00 a.m.

The Contractor shall notify the Engineer at least 7 days in advance of the start of the I-84 ramp closures. The closure period shall have prior approval from the Engineer.

All Other Roadways

During all other times:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 7:00 p.m.

Additional Lane Closure Restrictions

It is anticipated that work on adjacent projects will be ongoing simultaneously with this project. The Contractor shall be aware of those projects and anticipate that coordination will be required to maintain proper traffic flow at all times on all project roadways, in a manner consistent with these specifications and acceptable to the Engineer.

SECTION 1.10 – ENVIRONMENTAL COMPLIANCE

In Article 1.10.03-Water Pollution Control: BEST MANAGEMENT PRACTICES

Add the following after Best Management Practice Number 14:

15. The Contractor is hereby notified that the State listed species of Special Concern Eastern box turtle (*Terrapene carolina*), is present within the Project limits. In Connecticut, this terrestrial turtle lives in a variety of habitats, including woodlands, field edges, thickets, marshes, bogs, and stream banks. Typically, however, Eastern box turtles are found in well-drained forest bottomlands and open deciduous forests. They will use wetland areas at various times during the season. During the hottest part of a summer day, they will wander to find springs and seepages where they can burrow into the moist soil. Eastern box turtles overwinter in upland forest, a few inches under the soil surface, typically covered by leaf litter or woody debris. As soil temperatures drop, the turtles burrow into soft ground.

If work must be done during the Eastern box turtle's active period (April 1 to November 1) the Department will require precautionary measures to protect the Eastern box turtle and Eastern box turtle habitat. All construction activities taking place within the turtle's active period will need to be coordinated with the Department.

The Contractor shall through the Engineer at least 10 days prior to the commencement of any construction activities, arrange for a CT DOT Environmental Inspector from the Office of Environmental Planning (OEP) or their authorized delegate to be available to meet and discuss proper protocol for maintaining environmental commitments made to the protection of this species and habitat. OEP will provide oversight through the District to ensure that the following protocols are followed and maintained during the course of the Project:

- a. Exclusionary practices will be required where wetlands are present in order to prevent any turtle access into construction areas. These measures will need to be installed at the limits of disturbance as shown on the plans.
- b. All staging and storage areas, outside of previously paved locations, regardless of the duration of time they will be utilized, must be reviewed by and receive written approval from OEP through the District.
- c. All construction personnel working within the Eastern box turtle habitat must be apprised of the species description and the possible presence of a listed species.
- d. In areas where silt fence is used for exclusion, it shall be removed as soon as the area is stable to allow for reptile and amphibian passage to resume.

- e. Any Eastern box turtles encountered within the immediate work area shall be carefully moved to an adjacent area outside of the excluded area and the field inspector must immediately contact OEP with the location.
- f. No heavy machinery or vehicles may be parked in any Eastern box turtle habitat.
- g. Special precautions must be taken to avoid degradation of wetland habitats including any wet meadows and seasonal pools.
- h. The Contractor must search the work area each morning prior to any work being done.

This species is protected by state laws which prohibit killing, harming, taking, or keeping them in your possession. Workers shall be notified of the existence of Eastern box turtles in this area and be apprised of the laws protecting them. Photographs and the laws protecting Eastern box turtles (species ID sheets will be provided by OEP) shall be posted in the Contractor's and DOT field office. Any observations of this species are to be immediately reported to OEP at (860) 594-2937 or (860) 594-2938.

SECTION 4.06 BITUMINOUS CONCRETE

Section 4.06 is being deleted in its entirety and replaced with the following:

4.06.01—Description

4.06.02—Materials

4.06.03—Construction Methods

4.06.04—Method of Measurement

4.06.05—Basis of Payment

4.06.01—Description: Work under this section shall include the production, delivery and placement of a non-segregated, smooth and dense bituminous concrete mixture brought to proper grade and cross section. This section shall also include the method and construction of longitudinal joints. The Contractor shall furnish ConnDOT with a Quality Control Plan (QCP) as described in Article 4.06.03.

The terms listed below as used in this specification are defined as:

Bituminous Concrete: A concrete material that uses a bituminous material (typically asphalt) as the binding agent and stone and sand as the principal aggregate components. Bituminous concrete may also contain any of a number of additives engineered to modify specific properties and/or behavior of the concrete material. For the purposes of this Specification, references to bituminous concrete apply to all of its sub-categories, for instance those defined on the basis of production and placement temperatures, such as hot-mix asphalt (HMA) or warm-mix asphalt (WMA), or those defined on the basis of composition, such as those containing polymer-modified asphalt (PMA).

Course: A lift or multiple lifts comprised of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: All material placed in a single lift and as defined in Article 4.06.03.

Disintegration: Wearing away or fragmentation of the pavement. Disintegration will be evident in the following forms: Polishing, weathering-oxidizing, scaling, spalling, raveling, potholes or loss of material.

Dispute Resolution: A procedure used to resolve conflicts resulting from discrepancies between the Engineer and the Contractor's density results that may affect payment.

Hot Mix Asphalt (HMA): A bituminous concrete mixture typically produced at 325°F.

Lift: An application of a bituminous concrete mixture placed and compacted to a specified thickness in a single paver pass.

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications. All PMA mixtures shall incorporate a qualified warm mix technology.

Production Lot: All material placed during a continuous daily paving operation.

Quality Assurance (QA): All those planned and systematic actions necessary to provide confidence that a product or facility will perform as designed.

Quality Control (QC): The sum total of activities performed by the vendor (Producer, Manufacturer, and Contractor) to ensure that a product meets contract specification requirements.

Superpave: A bituminous concrete mix design used in mixtures designated as “S*” Where “S” indicates Superpave and * indicates the sieve related to the nominal maximum aggregate size of the mix.

Segregation: A non-uniform distribution of a bituminous concrete mixture in terms of gradation, temperature, or volumetric properties.

Warm Mix Asphalt (WMA): A bituminous concrete mixture that can be produced and placed at reduced temperatures than HMA using a qualified additive or technology.

4.06.02—Materials: All materials shall conform to the requirements of Section M.04.

1. Materials Supply: The bituminous concrete mixture must be from one source of supply and originate from one Plant unless authorized by the Engineer. Bituminous Concrete plant QCP requirements are defined in Section M.04.

2. Recycled Materials: Reclaimed Asphalt Pavement (RAP), Crushed Recycled Container Glass (CRCG), Recycled Asphalt Shingles (RAS), or crumb rubber (CR) from recycled tires may be incorporated in bituminous concrete mixtures in accordance with Section M.04 and Project Specifications. CRCG and RAS shall not be used in the surface course.

4.06.03—Construction Methods:

1. Material Documentation: All vendors producing bituminous concrete must have their truck-weighing scales, storage scales, and mixing plant automated to provide a detailed ticket.

Delivery tickets shall include the following information:

- a. State of Connecticut printed on ticket.
- b. Name of producer, identification of plant, and specific storage bin (silo) if used.
- c. Date and time of day.

- d. Mixture Designation; Mix type and level Curb mixtures for machine-placed curbing must state "curb mix only".
- e. If RAP is used, the plant printouts shall include the RAP dry weight, percentage and daily moisture content.
- f. If RAS is used, the plant printouts shall include the RAS dry weight and percentage daily moisture content.
- g. The delivery ticket for all mixes produced with Warm Mix Technology must indicate the additive name, and the injection rate (water or additive) incorporated at the HMA plant. The delivery ticket for all mixes produced with pre-blended WMA additive must indicate the name of the WMA Technology.
- h. Net weight of mixture loaded into truck (When RAP and/or RAS is used the moisture content shall be excluded from mixture net weight).
- i. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).
- j. Tare weight of truck – Daily scale weight.
- k. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
- l. Truck number for specific identification of truck.
- m. Individual aggregate, Recycled Materials, and virgin asphalt high/target/low weights. For drum plants and silo loadings, the plant printouts shall be produced at 5 minute intervals maintained by the vendor for a period of three years after the completion of the project.
- n. For every mixture designation the running daily total delivered and sequential load number.

The net weight of mixture loaded into the truck must be equal to the cumulative measured weight of its components.

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the weighing or recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one hour, but for no longer, provided that each load is weighed on State-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not fixed within forty-eight hours, mixture will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.

The State reserves the right to have an inspector present to monitor batching and /or weighing operations.

2. Transportation of Mixture: Trucks with loads of bituminous concrete being delivered to State projects must not exceed the statutory or permitted load limits referred to as gross vehicle weight (GVW). The Contractor shall furnish a list of all vehicles and allowable weights transporting mixture.

The State reserves the right to check the gross and tare weight of any delivery truck. A variation of 0.4 percent or less in the gross or tare weight shown on the delivery ticket and the certified scale weight shall be considered evidence that the weight shown on the delivery ticket is correct. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4 percent, the Engineer will recalculate the net weight. The Contractor shall take action to correct discrepancy to the satisfaction of the Engineer.

If a truck delivers mixture to the project and the ticket indicates that the truck is overweight, the load will not be rejected but a "Measured Weight Adjustment" will be taken in accordance with Article 4.06.04.

The mixture shall be transported from the mixing plant in trucks that have previously been cleaned of all foreign material and that have no gaps through which mixture might inadvertently escape. The Contractor shall take care in loading trucks uniformly so that segregation is minimized. Loaded trucks shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The front and rear of the cover must be fastened to minimize air infiltration. The Contractor shall assure that all trucks are in conformance with this specification. Trucks found not to be in conformance shall not be allowed to be loaded until re-inspected to the satisfaction of the Engineer.

Truck body coating and cleaning agents must not have a deleterious effect on the transported mixture. The use of solvents or fuel oil, in any concentration, is strictly prohibited for the coating of the inside of truck bodies. When acceptable coating or agents are applied, truck bodies shall be raised immediately prior to loading to remove any excess agent in an environmentally acceptable manner.

3. Paving Equipment: The Contractor shall have the necessary paving and compaction equipment at the project site to perform the work. All equipment shall be in good working order and any equipment that is worn, defective or inadequate for performance of the work shall be repaired or replaced by the Contractor to the satisfaction of the Engineer. During the paving operation, the use of solvents or fuel oil, in any concentration, is strictly prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices, etc.).

Refueling of equipment is prohibited in any location on the paving project where fuel might come in contact with bituminous concrete mixtures already placed or to be placed. Solvents for use in cleaning mechanical equipment or hand tools shall be stored clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

Pavers: Each paver shall have a receiving hopper with sufficient capacity to provide for a uniform spreading operation and a distribution system that places the mix uniformly, without segregation. The paver shall be equipped with and use a vibratory screed system with heaters or burners. The screed system shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible

screed units as part of the system shall have auger extensions and tunnel extenders as necessary. Automatic screed controls for grade and slope shall be used at all times unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed to compensate for irregularities in the preceding course or existing base. The controls shall maintain the proper transverse slope and be readily adjustable, and shall operate from a fixed or moving reference such as a grade wire or floating beam.

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Rollers types shall include steel-wheeled, pneumatic or a combination thereof and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination of. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the impacts per foot during the compaction process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be self-propelled and equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size; pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure is uniform for all wheels.

Lighting: For paving operations, which will be performed during hours of darkness, the paving equipment shall be equipped with lighting fixtures as described below, or with approved lighting fixtures of equivalent light output characteristics. Lighting shall maximize the illumination on each task and minimize glare to passing traffic. The Contractor shall provide generators on rollers and pavers of the type, size, and wattage, to adequately furnish electric power to operate the specified lighting equipment. The lighting options and minimum number of fixtures are listed in Tables 4.06-1 and 4.06-2:

TABLE 4.06-1: Paver Lighting

Option	Fixture Configuration	Fixture Quantity	Requirement
1	Type A	3	Mount over screed area
	Type B (narrow) or Type C (spot)	2	Aim to auger and guideline
	Type B (wide) or Type C (flood)	2	Aim 25 feet behind paving machine
2	Type D Balloon	2	Mount over screed area

TABLE 4.06-2: Roller Lighting

Option	Fixture Configuration*	Fixture Quantity	Requirement
1	Type B (wide)	2	Aim 50 feet in front of and behind roller
	Type B (narrow)	2	Aim 100 feet in front of and behind roller
2	Type C (flood)	2	Aim 50 feet in front of and behind roller
	Type C (spot)	2	Aim 100 feet in front of and behind roller
3	Type D Balloon	1	Mount above the roller

*All fixtures shall be mounted above the roller.

Type A: Fluorescent fixture shall be heavy-duty industrial type. Each fixture shall have a minimum output of 8,000 lumens. The fixtures shall be mounted horizontally, and be designed for continuous row installation.

Type B: Each floodlight fixture shall have a minimum output of 18,000 lumens.

Type C: Each fixture shall have a minimum output of 19,000 lumens.

Type D: Balloon light: Each balloon light fixture shall have a minimum output of 50,000 lumens, and emit light equally in all directions.

Material Transfer Vehicle (MTV): A MTV shall be used when placing a bituminous concrete surface course as indicated in the contract documents. A surface course is defined as the total thickness of the same bituminous concrete mix that extends up to and includes the final wearing surface whether it is placed in a single or multiple lifts, and regardless of any time delays between lifts.

The MTV must be a self-propelled vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery truck to the paver. The MTV must continuously remix the bituminous concrete mixture throughout the placement process.

The use of a MTV will be subject to the requirements stated in Article 1.07.05- Load Restrictions. The Engineer may limit the use of the vehicle if it is determined that the use of the MTV may damage highway components, utilities, or bridges. The Contractor shall submit to the Engineer at time of pre-construction the following information:

- The make and model of the MTV to be used.
- The individual axle weights and axle spacing for each separate piece of paving equipment (haul vehicle, MTV and paver).
- A working drawing showing the axle spacing in combination with all three pieces of equipment that will comprise the paving echelon.

4. Test Section: The Engineer may require the Contractor to place a test section whenever the requirements of this specification or Section M.04 are not met.

The Contractor shall submit the quantity of mixture to be placed and the location of the test section for review and acceptance by the Engineer. The equipment used in the construction of a passing test section shall be used throughout production.

If a test section fails to meet specifications, the Contractor shall stop production, make necessary adjustments to the job mix formula, plant operations, or procedures for placement and compaction. The Contractor shall construct test sections, as allowed by the Engineer, until all the required specifications are met. All test sections shall also be subject to removal as set forth in Article 1.06.04.

5. Transitions for Roadway Surface: Transitions shall be formed at any point on the roadway where the pavement surface deviates, vertically, from the uniform longitudinal profile as specified on the plans. Whether formed by milling or by bituminous concrete mixture, all transition lengths shall conform to the criteria below unless otherwise specified.

Permanent Transitions: A permanent transition is defined as any transition that remains as a permanent part of the work. All permanent transitions, leading and trailing ends shall meet the following length requirements:

- a) Posted speed limit is greater than 35 MPH: 30 feet per inch of vertical change (thickness)
- b) Posted speed limit is 35 MPH or less: 15 feet per inch of vertical change (thickness).
- c) Bridge Overpass and underpass transition length will be 75 feet either
 - (1) Before and after the bridge expansion joint, or
 - (2) Before or after the parapet face of the overpass.

In areas where it is impractical to use the above described permanent transition lengths the use of a shorter permanent transition length may be permitted when approved by the Engineer.

Temporary Transitions: A temporary transition is defined as a transition that does not remain a permanent part of the work. All temporary transitions shall meet the following length requirements:

- a) Posted speed limit is greater than 50 MPH
 - (1) Leading Transitions = 15 feet per inch of vertical change (thickness)
 - (2) Trailing Transitions = 6 feet per inch of vertical change (thickness)
- b) Posted speed limit is 40, 45, or 50 MPH
 - (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)
- c) Posted speed limit is 35 MPH or less
 - (1) Leading and Trailing = 3 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in-place over the winter shutdown period or during extended periods of inactivity (more than 14 calendar days) shall conform to the greater than 50 MPH requirements shown above.

6. Spreading and Finishing of Mixture: Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by sweeping or by other means acceptable to the Engineer. The bituminous concrete mixture shall not be placed whenever the surface is wet or frozen. The Engineer will verify the mix temperature by means of a probe or infrared type of thermometer. A probe type thermometer, verified by the Department on an annual basis, must be used in order to reject a load of mixture based on temperatures outside the range stated in the placement QCP.

Placement: The bituminous concrete mixture shall be placed and compacted to provide a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mix, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the plant.

In advance of paving, traffic control requirements shall be set up daily, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The Contractor shall inspect the newly placed pavement for defects in the mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impractical due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a uniform specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non-uniform thickness, i.e. wedge or shim course, shall not be subject to thickness and area adjustments.

- a) Thickness- Where the total thickness of the lift of mixture exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

TABLE 4.06-3: Thickness Tolerances

Mixture Designation	Lift Tolerance
S1	+/- 3/8 inch
S0.25, S0.375, S0.5	+/- 1/4 inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this specification.

- b) Area- Where the width of the lift exceeds that shown on the plans by more than the specified thickness of each lift, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating the adjustment in Article 4.06.04.
- c) Delivered Weight of Mixture - When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type the quantity of tons representing the overweight amount will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting a sufficient distance back from the previous run, existing bituminous concrete pavement or bituminous concrete driveways to expose the full thickness of the lift. A brush of tack coat shall be used on any cold joint immediately prior to additional bituminous concrete mixture being placed.

Tack Coat Application: Immediately before application, the area to be tacked shall be cleaned by sweeping or by other means acceptable to the Engineer. A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set) prior to any paving equipment or haul vehicles driving on it. All surfaces in contact with the bituminous concrete that have been in place longer than 3 calendar days shall have an application of tack coat. The tack coat shall be applied by a non-gravity pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gallons per square yard for a non-milled surface and an application rate of 0.05 to 0.07 gallons per square yard for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 0.03 to 0.05 gallons per square yard. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall not be heated in excess of 160°F and shall not be further diluted.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.03 and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage.

When placing a lift with a specified thickness less than one and one-half (1 ½) inches, or a wedge course, the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve. The procedure to be used shall be documented in the Contractor's QCP for placement and demonstrated on the first day of placement.

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic mode may damage highway components, utilities, or adjacent property, the Contractor shall provide alternate compaction equipment. The Engineer may allow the Contractor to operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting.

Rollers operating in the dynamic mode shall be shut off when changing directions.

These allowances will not relieve the Contractor from meeting pavement compaction requirements.

Surface Requirements: The pavement surface of any lift shall meet the following requirements for smoothness and uniformity. Any irregularity of the surface exceeding these requirements shall be corrected by the Contractor.

- a) Smoothness- Each lift of the surface course shall not vary more than $\frac{1}{4}$ inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be $\frac{3}{8}$ inch. Such tolerance will apply to all paved areas.
- b) Uniformity- The paved surface of the mat and joints shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.

7. Longitudinal Joint Construction Methods: The Contractor shall use Method I- Notched Wedge Joint (see Figure 4.06-1) when constructing longitudinal joints where lift thicknesses are between $1\frac{1}{2}$ and 3 inches, except for S1mixes. Method II Butt Joint (see Figure 4.06-2) shall be used for lifts less than $1\frac{1}{2}$ inches or greater than 3 inches, and S1mixes. During placement of multiple lifts of bituminous concrete, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inches from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. Each longitudinal joint shall maintain a consistent offset from the centerline of the roadway along its entire length. The difference in elevation between the two faces of any completed longitudinal joint shall not exceed $\frac{1}{4}$ of an inch in any location.

Method I - Notched Wedge Joint:

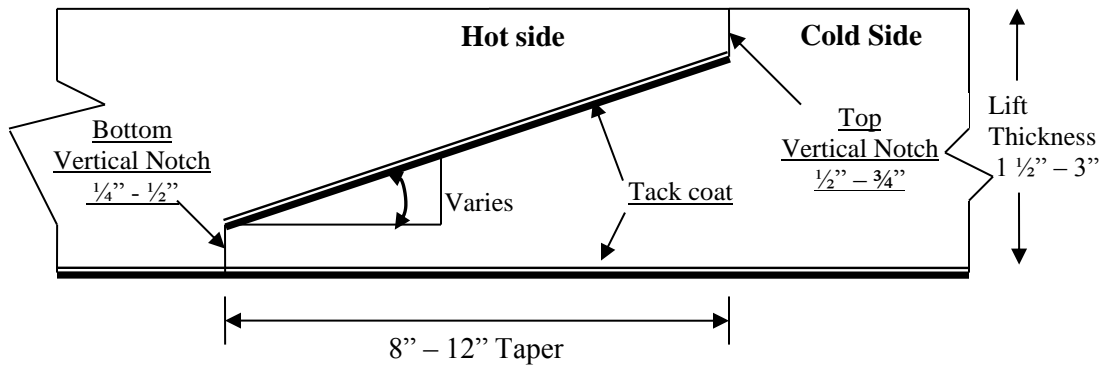


FIGURE 4.06-1: Notched Wedge Joint

A notched wedge joint shall be constructed as shown in Figure 4.06-1 using a device that is attached to the paver screed and is capable of independently adjusting the top and bottom vertical notches. The device shall have an integrated vibratory system.

The taper portion of the wedge joint must be placed over the longitudinal joint in the lift immediately below. The top vertical notch must be located at the centerline or lane line in the final lift. The requirement for paving full width “curb to curb” as described in Method II may be waived if addressed in the QC plan and approved by the Engineer.

The taper portion of the wedge joint shall be evenly compacted using equipment other than the paver or notch wedge joint device.

The taper portion of the wedge joint shall not be exposed to traffic for more than 5 calendar days.

The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance described in Sub article 4.06.03-7 does not apply to joint construction.

Any exposed wedge joint must be located to allow for the free draining of water from the road surface.

The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.

If Method I, Notched Wedge Joint cannot be used on lifts between 1.5 and 3 inches, Method III Butt Joint may be substituted according to the requirements below for “Method III – Butt Joint with Hot Pour Rubberized Asphalt Treatment.”

Method II - Butt Joint:

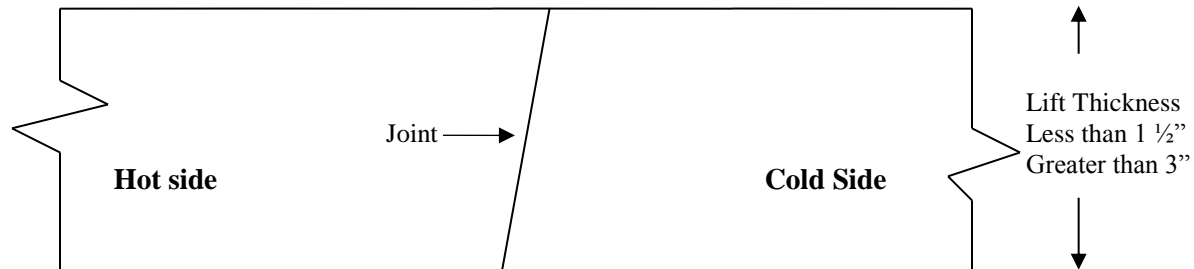


FIGURE 4.06-2: Butt Joint

When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to Figure 4.06-2). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width “curb to curb.”

Method III- Butt Joint with Hot Poured Rubberized Asphalt Treatment: If Method I Wedge Joint cannot be used due to physical constraints in certain limited locations; the contractor may submit a request in writing for approval by the Engineer, to utilize Method III Butt Joint as a substitution in those locations. There shall be no additional measurement or payment made when the Method III Butt Joint is substituted for the Method I Notched Wedge Joint. When required by the contract or approved by the Engineer, Method III (see Figure 4.06-3) shall be used.

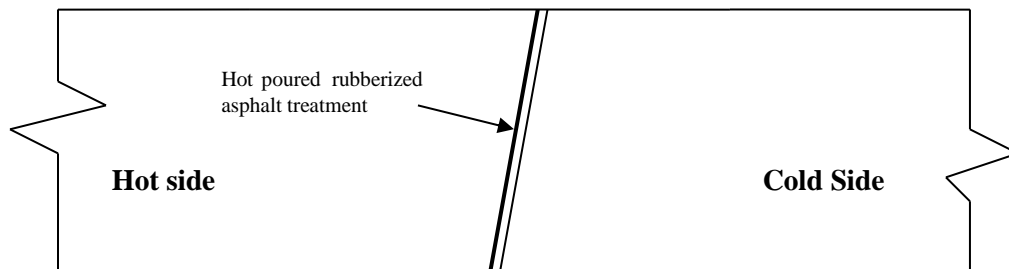


FIGURE 4.06-3: Butt Joint with Hot Poured Rubberized Asphalt Treatment

All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a rubberized joint seal material meeting the requirements of ASTM D 6690, Type 2. The joint sealant shall be placed on the face of the “cold side” of the butt joint as shown above prior to placing the “hot side” of the butt joint. The joint seal material

shall be applied in accordance with the manufacturer's recommendation so as to provide a uniform coverage and avoid excess bleeding onto the newly placed pavement.

8. Contractor Quality Control (QC) Requirements:

The Contractor shall be responsible for maintaining adequate quality control procedures throughout the production and placement operations. Therefore, the Contractor must ensure that the materials, mixture and work provided by Subcontractors, Suppliers and Producers also meet contract specification requirements.

This effort must be documented in Quality Control Plans and address the actions, inspection, or sampling and testing necessary to keep the production and placement operations in control, to determine when an operation has gone out of control and to respond to correct the situation in a timely fashion.

The Standard QCP for production shall consist of the quality control program specific to the production facility.

There are three components to the QCP for placement: a Standard QCP, a Project Summary Sheet that details project specific information, and if applicable a separate Extended Season Paving Plan as required in Section 9 "Temperature and Seasonal Requirements".

The Standard QCP for both production and placement shall be submitted to the Department for approval each calendar year and at a minimum of 30 days prior to production or placement.

Production or placement shall not occur until all QCP components have been approved by the Engineer.

Each QCP shall include the name and qualifications of a Quality Control Manager (QCM). The QCM shall be responsible for the administration of the QCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the project during paving operations. All Contractor sampling, inspection and test reports shall be reviewed and signed by the QCM prior to submittal to the Engineer. The QCPs shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Approval of the QCP does not relieve the Contractor of its responsibility to comply with the project specifications. The Contractor may modify the QCPs as work progresses and must document the changes in writing prior to resuming operations. These changes include but are not limited to changes in quality control procedures or personnel. The Department reserves the right to deny significant changes to the QCPs.

QCP for Production: Refer to Section M.04.03-1.

QCP for Placement: The Standard QCP, Project Summary Sheet, and Extended Season Paving Plan shall conform to the format provided by the Engineer. The format is available at http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf.

The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that bituminous concrete placement conforms to the requirements as outlined in its QCP during all phases of the work. The Contractor shall document these activities for each day of placement.

The Contractor shall submit complete field density testing and inspection records to the Engineer within 48 hours in a manner acceptable to the Engineer.

The Contractor may obtain one (1) mat core and one (1) joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the location of each process control core to the Engineer for approval prior to taking the core. The core holes shall be filled to the same requirements described in Sub article 4.06.03-10.

9. Temperature and Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into two seasons, “In-Season” and “Extended-Season”. In-Season paving occurs from May 1 – October 14, and Extended Season paving occurs from October 15-April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Bituminous concrete mixes shall not be placed when the air or sub base temperature is below 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the project that addresses minimum delivered mix temperature considering WMA, PMA or other additives, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

10. Density Testing of Bituminous Concrete Utilizing Core Samples: This procedure describes the frequency and the method the Contractor shall use to obtain pavement cores for acceptance from the project.

Coring shall be performed on each lift specified to a thickness of one and one-half (1 ½) inches or more. All material placed in a lift shall be compacted to the degree specified in Tables 4.06-9 and 4.06-10. The density of each core will be determined using the production lot’s average maximum theoretical specific gravity (Gmm) established during the testing of the parent material at the plant. When there was no testing of the parent material or any Gmm exceeds the specified tolerances in the Department’s current QA Program for Materials, the Engineer will determine

the maximum theoretical density value to be used for density calculations. Bituminous concrete HMA S1 mixes are excluded from the longitudinal joint density requirements.

The Contractor shall extract cores (4 or 6 inch diameter for S0.25, S0.375 and S0.5 mixes, 6 inch diameter for S1.0 mixtures -wet sawed) from sampling locations determined by the Engineer. The Engineer must witness the extraction and labeling of cores, as well as the filling of the core holes. The cores shall be labeled by the Contractor with the project number, lot number, and sub-lot number on the top surface of the core. When labeling the core lot number, include whether the core is from a mat lot or joint lot by using an “M” for a mat core and “J” for a joint core. For example, a core from the first sub-lot of the first mat lot shall be labeled with “Lot M1 – 1”. The first number refers to the lot and the second number refers to the sub-lot. Refer to Figure 4.06-4. The side of the cores shall be labeled with the core lot number and date placed. The project inspector shall fill out a MAT-109 containing the same information to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the Department’s Central Testing Lab in a safe manner to ensure no damage occurs to the cores. The Contractor shall use a container approved by the Engineer. In general the container shall consist of an attached lid container made out of plastic capable of being locked shut and tamper proof. The Contractor shall use foam, bubble wrap, or another suitable material to prevent the cores from being damaged during transportation. Once the cores and MAT-109 are in the container the Engineer will secure the lid using a security seal. The security seal’s identification number must be documented on the MAT-109. The Central Lab will break the security seal and take possession of the cores upon receipt.

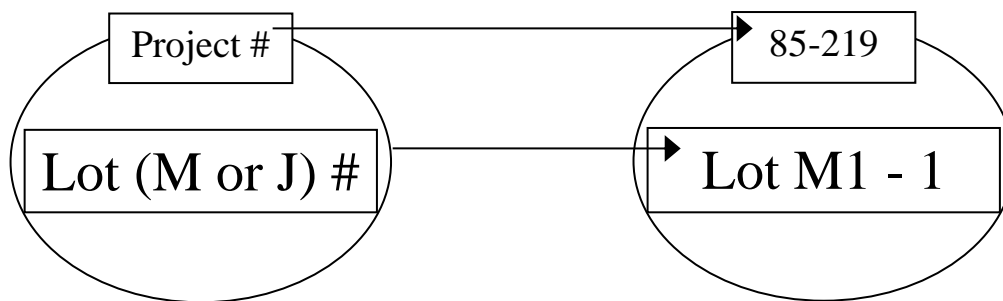


FIGURE 4.06-4: Labeling of Cores

Frequency of sampling is in accordance with the following tables:

TABLE 4.06-4: Testing Requirement for Bridge Density Lot

Length of Each Structure (Feet)	MAT – No. of Cores	JOINT - No. of cores
≤ 500'	See Table 4.06-5(A or B)	See Table 4.06-5(A or B)
501' – 1500'	3	3
1501' – 2500'	4	4
2501' and greater	5	5

All material placed on structures less than or equal to 500 feet in length shall be included as part of a standard lot as follows:

TABLE 4.06-5A: Testing requirement for Density Lots \geq 500 Tons

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Lot Without Bridge ⁽¹⁾	4		4		2000
Lot With Bridge(s) ⁽¹⁾⁽²⁾	4 plus	1 per structure ($\leq 300'$)	4 plus	1 per structure ($\leq 300'$)	2000
		2 per structure (301' – 500')		2 per structure (301' – 500')	

TABLE 4.06-5B: Testing requirement for Density Lots $<$ 500 Tons

Lot Type	No. of Mat Cores	No. of Joint Cores	Lot Size (Tons)
Lot Without Bridge ⁽¹⁾	3	3	1 per lift
Lot With Bridge(s) ⁽¹⁾⁽²⁾	3	3	1 per lift

Notes:

⁽¹⁾ The number of “Required Paver Passes for Full Width” shall be used to determine the sub-lot sizes within the lot. The number of paver passes for full width is determined by the contractor.

⁽²⁾ If a non-bridge mat or joint core location randomly falls on a structure, the core is to be obtained on the structure in addition to the core(s) required on the structure.

A density lot will be complete when the full designed paving width of the established lot length has been completed and shall include all longitudinal joints that exist between the curb lines regardless of date(s) paved. Quantity of material placed on structures less than or equal to 500 feet long is inclusive of the standard lot. Prior to paving, the total length of the project to be paved shall be split up into lots that contain approximately 2000 tons each. Areas such as highway ramps may be combined to create one lot. In general, combined areas should be set up to target a 2000 ton lot size. One adjustment will apply for each lot. The tons shall be determined using the yield calculation in Article 4.06.04. The last lot shall be the difference between the total payable tons for the project and the sum of the previous lots.

After the compaction process has been completed, the material shall be allowed to cool sufficiently to allow the cutting and removal of the core without damage. The Contractor shall core to a depth that allows extraction so that the uppermost layer being tested for density will not be affected.

A mat core shall not be taken any closer than one foot from the edge of a paver pass. If a random number locates a core less than one foot from any edge, locate the core so that the sample is one foot from the edge.

Method I, Notched Wedge Joint cores shall be taken so that the center of the core is 5 inches from the visible joint on the hot mat side. Refer to Figure 4.06-5.

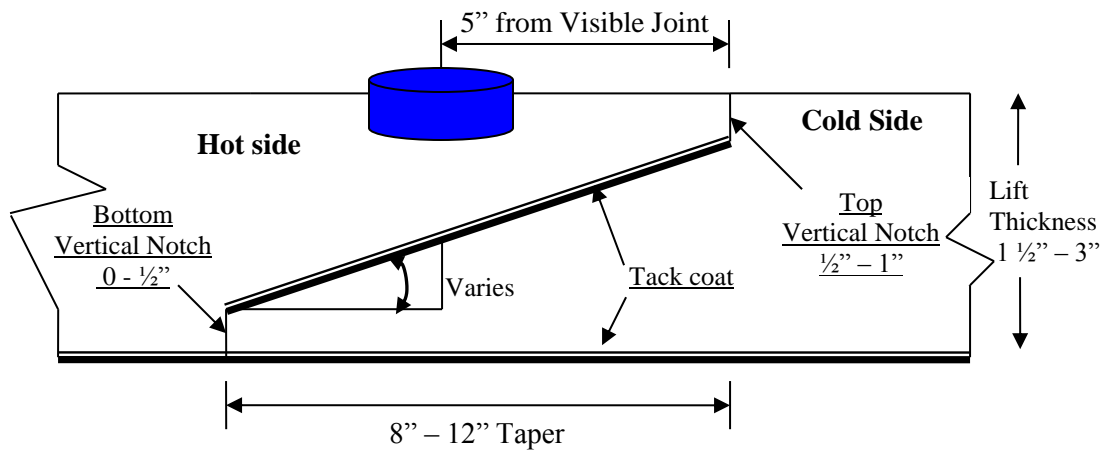


FIGURE 4.06-5: Notched Wedge Joint Cores

When Method III Butt Joint is utilized, cores shall be taken from the hot side so the edge of the core is within 1 inch of the longitudinal joint.

All cores must be cut within 5 calendar days of placement. Any core that is damaged or obviously defective while being obtained will be replaced with a new core from a location within 2 feet measured in a longitudinal direction.

Each core hole shall be filled within four hours upon core extraction. Prior to being filled, the hole shall be prepared by removing any free water and applying tack coat using a brush or other means to uniformly cover the cut surface. The core hole shall be filled using a bituminous concrete mixture at a minimum temperature of 240°F containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete fill shall be compacted to 1/8 inch above the finished pavement.

11. Acceptance Inspection, Sampling and Testing: Inspection, sampling, and testing to be used by the Engineer shall be performed at the minimum frequency specified in Section M.04 and stated herein.

Sampling for acceptance shall be established using ASTM D 3665, or a statistically based procedure of random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required acceptance sampling, testing and inspection during all phases of the work in accordance with Section M.04. The Department will perform verification testing on the Contractor's acceptance test results. Should binder content, theoretical maximum density (Gmm), or air void results exceed the specified tolerances in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures, the Department will investigate to determine an assignable cause. Contractor test results for a subject lot or sub lot may be replaced with the Department's

results for the purpose of assessing adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing on the cores in accordance with AASHTO T 331.

12. Density Dispute Resolution Process: The Contractor and Engineer will work in partnership to avoid potential conflicts and to resolve any differences that may arise during quality control or acceptance testing for density. Both parties will review their sampling and testing procedures and results and share their findings. If the Contractor disputes the Engineer's test results, the Contractor must submit in writing a request to initiate the Dispute Resolution Process within 7 calendar days of the notification of the test results. No request for dispute resolution will be allowed unless the Contractor provides quality control results within the timeframe described in Sub article 4.06.03-9 supporting its position. No request for Dispute Resolution will be allowed for a Density Lot in which any core was not taken within the required 5 calendar days of placement. Should the dispute not be resolved through evaluation of existing testing data or procedures, the Engineer may authorize the Contractor to obtain a new set of core samples per disputed lot. The core samples must be extracted no later than 14 calendar days from the date of Engineer's authorization.

The number and type (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and type of the cores taken for acceptance. The location of each core shall be randomly located within the respective original sub lot. All such core samples shall be extracted and filled using the procedure outlined in Article 4.06.03. The results from the dispute resolution cores shall be added to the results from the acceptance cores and averaged for determining the final in-place density value.

13. Corrective Work Procedures: Any portion of the completed pavement that does not meet the requirements of the specification shall be corrected at the expense of the Contractor. Any corrective courses placed as the final wearing surface shall match the specified lift thickness after compaction.

If pavement placed by the Contractor does not meet the specifications, and the Engineer requires its replacement or correction, the Contractor shall:

- a) Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:
 - Limits of pavement to be replaced or corrected, indicating stationing or other landmarks that are readily distinguishable.
 - Proposed work schedule.
 - Construction method and sequence of operations.
 - Methods of maintenance and protection of traffic.
 - Material sources.
 - Names and telephone numbers of supervising personnel.

- b) Perform all corrective work in accordance with the Contract and the approved corrective procedure.

14. Protection of the Work: The Contractor shall protect all sections of the newly finished pavement from damage that may occur as a result of the Contractor's operations for the duration of the Project. Prior to the Engineer's authorization to open the pavement to traffic, the Contractor is responsible to protect the pavement from damage.

15. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the bituminous concrete pavement to the lines delineated on the plans or as directed by the Engineer. The cut shall provide a straight, clean, vertical face with no cracking, tearing or breakage along the cut edge.

4.06.04—Method of Measurement:

1. HMA S* or PMA S*: The quantity of bituminous concrete measured for payment will be determined by the documented net weight in tons accepted by the Engineer in accordance with this specification and Section M.04.

2. Adjustments: Adjustments may be applied to bituminous concrete quantities and will be measured for payment using the following formulas:

Yield Factor for Adjustment Calculation = 0.0575 Tons/SY/inch

Actual Area = [(Measured Length (ft)) x (Avg. of width measurements (ft))]

Actual Thickness (t) = Total tons delivered / [Actual Area (SY) x 0.0575 Tons/SY/inch]

- a) Area: If the average width exceeds the allowable tolerance, an adjustment will be made using the following formula. The tolerance for width is equal to the specified thickness (in.) of the lift being placed.

Tons Adjusted for Area (T_A) = $[(L \times W_{adj})/9] \times (t) \times 0.0575 \text{ Tons/SY/inch} = (-) \text{ Tons}$

Where: L = Length (ft)

(t) = Actual thickness (inches)

$W_{adj} = (\text{Designed width (ft)} + \text{tolerance} / 12) - \text{Measured Width}$

- b) Thickness: If the actual thickness is less than the allowable tolerance, the Contractor shall submit a repair procedure to the Engineer for approval. If the actual thickness exceeds the allowable tolerance, an adjustment will be made using the following formula:

Tons Adjusted for Thickness (T_T) = $A \times t_{adj} \times 0.0575 = (-) \text{ Tons}$

Where: $A = \text{Area} = \{ [L \times (\text{Designed width} + \text{tolerance (lift thickness)}) / 12] / 9 \}$
 $t_{\text{adj}} = \text{Adjusted thickness} = [(Dt + \text{tolerance}) - \text{Actual thickness}]$
 $Dt = \text{Designed thickness (inches)}$

- c) **Weight:** If the quantity of bituminous concrete representing the mixture delivered to the project is in excess of the allowable gross vehicle weight (GVW) for each vehicle, an adjustment will be made using the following formula:

Tons Adjusted for Weight (T_w) = GVW – DGW = (-) Tons

Where: DGW = Delivered gross weight as shown on the delivery ticket or measured on a certified scale.

- d) **Mixture Adjustment:** The quantity of bituminous concrete representing the production lot will be adjusted based on test results and values listed in Tables 4.06-6 and 4.06-7, . The Department's Division of Material Testing will calculate the daily adjustment value for T_{SD} .

The adjustment values in Table 4.06-6 and 4.06-7 shall be calculated for each sub lot based on the Air Void and Liquid Binder Content test results for that sub lot. The total adjustment for each day's production (lot) will be computed using tables and the following formulas:

Tons Adjusted for Superpave Design (T_{SD}) = $[(\text{AdjAV}_t + \text{AdjPB}_t) / 100] \times \text{Tons}$

Percent Adjustment for Air Voids = $\text{AdjAV}_t = [\text{AdjAV}_1 + \text{AdjAV}_2 + \text{AdjAV}_i + \dots + \text{AdjAV}_n] / n$

Where: AdjAV_t = Total percent air void adjustment value for the lot
 AdjAV_i = Adjustment value from Table 4.06-7 resulting from each sub lot or the average of the adjustment values resulting from multiple tests within a sub lot, as approved by the Engineer.
 n = number of sub lots based on Table M.04.03-1

TABLE 4.06-6: Adjustment Values for Air Voids

Adjustment Value (AdjAV_i) (%)	S0.25, S0.375, S0.5, S1 Air Voids (AV)
+2.5	3.8 - 4.2
+3.125*(AV-3)	3.0 - 3.7
-3.125*(AV-5)	4.3 - 5.0
20*(AV-3)	2.3 - 2.9
-20*(AV-5)	5.1 - 5.7
-20.0	≤ 2.2 or ≥ 5.8

Positive air void adjustment values will not be calculated for any test that fails to meet gradation or binder content tolerances of the JMF in Table M.04.03– 5.

Percent Adjustment for Liquid Binder = $\text{AdjPB}_t = [(\text{AdjPB}_1 + \text{AdjPB}_2 + \text{AdjPB}_i + \dots + \text{AdjPB}_n)] / n$

Where: AdjPB_t = Total percent liquid binder adjustment value for the lot

AdjPB_i = Adjustment value from Table 4.06-7 resulting from each sub lot

n = number of binder tests in a production lot

TABLE 4.06-7: Adjustment Values for Binder Content

Adjustment Value (AdjAV_i) (%)	<u>S0.25, S0.375, S0.5, S1</u> Pb (refer to Table M.04.02-5)
0.0	Equal to or above the min. liquid content
- 10.0	Below the min. liquid content

- e) Density Adjustment: The quantity of bituminous concrete measured for payment in a lift of pavement specified to be 1½ inches or greater may be adjusted for density. Separate density adjustments will be made for each lot and will not be combined to establish one density adjustment. If either the Mat or Joint adjustment value is “remove and replace”, the density lot shall be removed and replaced (curb to curb).

No positive adjustment will be applied to a Density Lot in which any core was not taken within the required 5 calendar days of placement.

Tons Adjusted for Density (T_D) = $[(\text{PA}_M \times .50) + (\text{PA}_J \times .50)] / 100] \times \text{Density Lot Tons}$

Where: T_D = Total tons adjusted for density for each lot

PA_M = Mat density percent adjustment from Table 4.06-9

PA_J = Joint density percent adjustment from Table 4.06-10

TABLE 4.06-9: Adjustment Values for Pavement Mat density

Average Core Result Percent Mat Density	Percent Adjustment (Bridge and Non-Bridge) ⁽¹⁾⁽²⁾
97.1 - 100	-1.667*(ACRPD-98.5)
94.5 – 97.0	+2.5
93.5 – 94.4	+2.5*(ACRPD-93.5)
92.0 – 93.4	0
90.0 – 91.9	-5*(92-ACRPD)
88.0 – 89.9	-10*(91-ACRPD)
87.0 – 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

TABLE 4.06-10: Adjustment Values for Pavement Joint Density

Average Core Result Percent Joint Density	Percent Adjustment (Bridge and Non-Bridge) ⁽¹⁾⁽²⁾
97.1 – 100	-1.667*(ACRPD-98.5)
93.5 – 97.0	+2.5
92.0 – 93.4	+1.667*(ACRPD-92)
91.0 – 91.9	0
89.0 – 90.9	-7.5*(91-ACRPD)
88.0 – 88.9	-15*(90-ACRPD)
87.0 – 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

⁽¹⁾ ACRPD = Average Core Result Percent Density

⁽²⁾ All Percent Adjustments to be rounded to the second decimal place. For example, 1.667 is to be rounded to 1.67.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be measured under the appropriate item used in the formation of the transition.

The quantity of material used for the installation of temporary transitions shall be measured for payment under the appropriate item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is not measured for payment.

4. Cut Bituminous Concrete Pavement: The quantity of bituminous concrete pavement cut will be measured in accordance with Article 2.02.04.

5. Material for Tack Coat: The quantity of tack coat will be measured for payment by the number of gallons furnished and applied on the Project and approved by the Engineer. No tack coat material shall be included that is placed in excess of the tolerance described in Article 4.06.03.

Method of Measurement:

- a. Container Method- Material furnished in a container will be measured to the nearest ½ gallon. The volume will be determined by either measuring the volume in the original container by a method approved by the Engineer or using a separate graduated container capable of measuring the volume to the nearest ½ gallon. The container in which the material is furnished must include the description of material, including lot number or batch number and manufacturer or product source.
- b. Truck Method- The Engineer will establish a weight per gallon of the tack coat based on the density at 60°F for the material furnished. The number of gallons furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor, or from the automated metering system on the delivery vehicle.

6. Material Transfer Vehicle (MTV): The furnishing and use of a MTV will be measured separately for payment based on the actual number of surface course tons delivered to a paver using the MTV.

4.06.05—Basis of Payment:

1. HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for “HMA S*” or “PMA S*”.

- All costs associated with providing illumination of the work area are included in the general cost of the work.
- All costs associated with cleaning the surface to be paved, including mechanical sweeping, are included in the general cost of the work. All costs associated with constructing longitudinal joints are included in the general cost of the work.
- All costs associated with obtaining cores for acceptance testing and dispute resolution are included in the general cost of the work.

2. Bituminous Concrete Adjustment Costs: The adjustment will be calculated using the formulas shown below if all of the measured adjustments in Article 4.06.04 are not equal to zero. A positive or negative adjustment will be applied to monies due the Contractor.

Production Lot: $[T_T + T_A + T_W + (T_{MD} \text{ or } T_{SD})] \times \text{Unit Price} = \text{Est. (P)}$

Density Lot: $T_D \times \text{Unit Price} = \text{Est. (D)}$

Where: Unit Price = Contract unit price per ton per type of mixture

T_* = Total tons of each adjustment calculated in Article 4.06.04

Est. () = Pay Unit represented in dollars representing incentive or disincentive.

The Bituminous Concrete Adjustment Cost item if included in the bid proposal or estimate is not to be altered in any manner by the Contractor. If the Contractor should alter the amount shown, the altered figure will be disregarded and the original estimated cost will be used for the Contract.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be paid under the appropriate item used in the formation of the transition. The quantity of material used for the installation of temporary transitions shall be paid under the appropriate pay item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is included in the general cost of the work.

4. The cutting of bituminous concrete pavement will be paid in accordance with Article 2.02.05.

5. Material for tack coat will be paid for at the Contract unit price per gallon for "Material for Tack Coat".

6. The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for a "Material Transfer Vehicle".

<u>Pay Item*</u>	<u>Pay Unit*</u>
HMA S*	ton
PMA S*	ton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	gal.
Material Transfer Vehicle	ton

*For contracts administered by the State of Connecticut, Department of Administrative Services, the pay items and pay units are as shown in contract award price schedule.

SECTION 5.14 – PRESTRESSED CONCRETE MEMBERS

Section 5.14 is hereby amended as follows:

5.14.01 – Description:

Add the following sentence at the end of the Article:

“Work under this item shall also consist of furnishing and erecting temporary bearings, of the type and size shown on the plans, including non-compressible blockouts, elastomeric pads, and adhesive as directed by the Engineer and in accordance with these specifications.”

5.14.02 – Materials:

Add the following paragraph at the end of the Article:

“Elastomeric bearing pads shall conform to the requirements of Article M.17.01, shall be unlaminated, and shall be fabricated from Grade 50 elastomer or greater. All blockouts shall be fabricated from material with a minimum compressive strength of 1000psi as approved by the Engineer. Adhesive for bonding the elastomeric pads to concrete shall conform to the requirements of Article M.17.01.”

5.14.03 – Construction Methods:

Add the following paragraph at the end of the Article:

“Construction methods for the elastomeric bearing pads shall conform to the requirements of section 5.21.03. Non-compressible blockouts shall be placed permanently in the position and orientation as shown on the plans. Care shall be taken to ensure that the placement of the prestressed concrete members does not damage or alter the position of the elastomeric pad or the non-compressible blockout. Before fabricating the non-compressible blockout, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Subarticle 1.05.02-3. These drawings shall include but not be limited to the following information: The name of the manufacturer, complete details of the non-compressible blockout and pertinent material designations as directed by the Engineer and in accordance with these specifications.”

5.14.04 – Method of Measurement:

Add the following sentence at the end of the Article:

“Elastomeric pads, adhesive and non-compressible blockouts will not be measured for payment.”

5.14.05 – Basis of Payment:

Add the following Pay Item and Pay Unit at the end of the Article:

“Prestressed Concrete Beam

l.f.”

SECTION 6.01 – CONCRETE FOR STRUCTURES

Section 6.01 is hereby amended as follows:

6.01.02 – Materials:

Add the following to the end of the Article:

FRP Composite Stay-In-Place Forms: The following FRP composite stay-in-place form products or approved equal shall be used for this item.

<u>Product</u>	<u>Supplier</u>
SAPLANK®	Strongwell Bristol Division 400 Commonwealth Avenue Bristol, VA 24201-3820 USA
TUF-DEK™	Creative Pultrusions, Inc. 214 Industrial Park Rd Alum Bank, PA 15521
Tuff Span FRP Form Deck	Enduro 16602 Central Green Blvd Houston, TX 77032

Mortar Bed for FRP Stay-in-place Form: Mortar used for placement of stay-in-place FRP forms shall be non-metallic and low-shrink cementitious conforming to ASTM C928.

6.01.03 – Construction Methods:

Sub Article “**(f) Bridge Decks:**” *replace the phrase “haunch depths” with the phrase “deck thicknesses.”*

Sub Article “**(g) Stay-In-Place Metal Forms for Bridge Decks:**” *Delete in its entirety and replace with the following:*

(g) Stay-In-Place Fiber Reinforced Polymer (GFRP) Forms for Bridge Decks: These forms may be used if shown in the Contract documents or approved by the Engineer. Prior to the use of such forms and before fabricating any material, the Contractor shall submit working drawings to

the Engineer for review in accordance with 1.05.02, Working Drawings. These drawings shall include the proposed method of form construction, erection plans including placement plans, attachment details, material lists, material designation, gage of all materials, and the details of corrugation. Also, copies of the form design computations shall be submitted with the working drawings. Any changes necessary to accommodate stay-in-place forms, if approved, shall be at no cost to the Department.

The FRP forms shall be designed on the basis of the dead load of the form, reinforcement and the plastic concrete, including the additional weight (mass) of concrete [considered to be equivalent to the weight (mass) imposed by an additional concrete thickness equal to three percent (3%) of the proposed deck thickness, but not to exceed 0.3 inches (8 mm)] due to the deflection of the GFRP forms, plus 50 pounds per square foot (2.40 kilopascals) for construction loads. The allowable stress in the corrugated form and the accessories shall not be greater than 0.725 times the yield strength of the furnished material and the allowable stress shall not exceed 36,000 psi (250 megapascals). The span for design and deflection shall be the clear distance between edges of the beams or girders less 2 inches (50 mm) and shall be measured parallel to the form flutes. The maximum deflection under the weight (mass) of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form span or 0.5 inches (13 mm), whichever is less. In no case shall the loading used to estimate this deflection be less than 120 pounds per square foot (586 kilograms per square meter). The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the foregoing limits. The form support angles shall be designed as a cantilever and the horizontal leg of the form support angle shall not be greater than 3 inches (75 mm).

Stay-in-place FRP forms shall be placed over or be directly supported by the top flanges of beams or girders, and secured in place until concrete is set.

Stay-in-place FRP forms shall not be used in bays where longitudinal slab construction joints are located, under cantilevered slabs such as the overhang outside of fascia members, and bridges where the clearance over a salt-laden body of water is less than 15 feet (4.5 m) above mean high water level.

Drilling of holes in pre-stressed concrete beams or the use of power-actuated tools on the pre-stressed concrete beams for fastening of the form supports to the pre-stressed concrete beams will not be permitted.

All edges of openings cut for drains, pipes, and similar appurtenances shall be independently supported around the entire periphery of the opening.

All fabricated stay-in-place FRP forms shall be unloaded, stored at the Project site at least 4 inches (100 mm) above the ground on platforms, skids or other suitable supports and shall be protected from direct sunlight and damage and handled in such a manner as to preclude damage to the forms. Damaged material shall be replaced at no additional cost to the State.

The forms shall be installed from the topside in accordance with the manufacturer's recommended installation procedures. Stay-in-place FRP forms shall have a minimum depth of the form valley equal to 2 inches (50 mm). The forms shall have closed tapered ends. Lightweight filler material may be used in the form valleys.

All field cutting shall be done with a steel cutting saw or shears including the cutting of supports, closures and cutouts. Flame cutting of forms is not permitted.

The depth of the concrete slab shall be as shown on the plans . All reinforcement in the bottom reinforcement mat shall have a minimum concrete cover of 1 inch (25 mm) unless noted otherwise on the plans.

The completed stay-in-place FRP form system shall be sufficiently tight to prevent leakage of mortar. Where forms or their installation are unsatisfactory in the opinion of the Engineer, either before or during placement of the concrete, the Contractor shall correct the defects before proceeding with the work.

SECTION 9.21 CONCRETE SIDEWALKS AND RAMPS

Section 9.21 is being deleted in its entirety and replaced with the following:

9.21.01 – Description

9.21.02 – Materials

9.21.03 – Construction Methods

9.21.04 – Method of Measurement

9.21.05 – Basis of Payment

9.21.01—Description: This item shall consist of concrete sidewalks and ramps constructed on a gravel or reclaimed miscellaneous aggregate base course in the locations and to the dimensions and details shown on the plans or as ordered and in accordance with these specifications.

9.21.02—Materials: Materials for this work shall conform to the requirements of Article M.03.01 for Class “F” Concrete.

Gravel or reclaimed miscellaneous aggregate for base shall conform to Article M.02.01 for granular fill.

Detectable warning strips shall be a prefabricated detectable warning tile chosen from the Department’s Qualified Products List for retrofit and/or cast in place applications.

9.21.03—Construction Methods:

1. Excavation: Excavation, including removal of any existing sidewalk (bituminous or concrete) and curbing, shall be made to the required depths below the finished grade, as shown on the plans or as directed. All soft and yielding material shall be removed and replaced with suitable material.

When connecting new concrete sidewalk to a section of existing concrete sidewalk, the connection point shall be at the nearest joint in the existing sidewalk.

The Contractor shall establish the limits required to achieve grades for each ramp prior to removal of existing sidewalk and ramps. The Contractor shall document and notify the Engineer of any control points that may conflict with the design grades or configuration of ramps shown on the plans. Control points can be but are not limited to ROW, utility poles, drainage structures, buildings, fences, walls or other features found near the proposed ramp. When control points are encountered within the limits of the ramp, the Engineer will determine if an alternative ramp type is required or the ramp is to be constructed as shown on the plans.

2. Gravel or Reclaimed Miscellaneous Aggregate Base: The gravel or reclaimed miscellaneous aggregate base shall be placed in layers not over 6 inches in depth and to such a depth that after compaction it shall be at the specified depth below the finished grade of the walk. The base shall be wetted and rolled or tamped after the spreading of each layer.

3. Forms: Forms shall be of metal or wood, straight, free from warp and of sufficient strength to resist springing from the pressure of the concrete. If made of wood, they shall be of 2-inch surfaced plank except that at sharp curves thinner material may be used. If made of metal, they shall be of an approved section and have a flat surface on the top. Forms shall be of a depth equal to the depth of the sidewalk. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of mortar. All forms

shall be cleaned and oiled or wetted before concrete is placed against them. Sheet metal templates 1/8 inch in thickness, of the full depth and width of the walk, shall be spaced at intervals of 12 feet or as directed. If the concrete is placed in alternate sections, these templates shall remain in place until concrete has been placed on both sides of the template. As soon as the concrete has obtained its initial set, the templates shall be removed.

4. Concrete: The concrete shall be proportioned, mixed, placed, etc., in accordance with the provisions of Section 6.01 for Class “F” Concrete. Concrete shall be cured in accordance with the provisions of Article 4.01.03 for Concrete Pavement.

5. Finishing: The surface of the concrete shall be finished with a wood float or by other approved means. The outside edges of the slab and all joints shall be edged with a 1/4-inch radius edging tool. Each slab shall be divided into two or more sections by forming dummy joints with a jointing tool as directed.

6. Backfilling and Removal of Surplus Material: The sides of the sidewalk shall be backfilled with suitable material thoroughly compacted and finished flush with the top of the sidewalk. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer.

7. Detectable Warning Strip: The detectable warning strip for new construction shall be set directly in poured concrete and each tile shall be weighted down to prevent the tile from floating after placement in wet concrete in accordance with curing procedures. Install detectable warning strip, according to the plans and the Manufacturer’s specifications, or as directed by the Engineer.

The detectable warning strip for retrofit construction shall be installed according to the plans in the direction of pedestrian route and contained wholly within painted crosswalk when present. Its installation shall conform to all Manufactures requirements.

9.21.04—Method of Measurement: This work will be measured for payment as follows:

1. Concrete Sidewalk or Sidewalk Ramp: This work will be measured by the actual number of square feet of completed and accepted concrete sidewalk or ramp.

2. Excavation: Excavation below the finished grade of the sidewalk or ramp, backfilling, and disposal of surplus material will not be measured for payment, but the cost shall be included in the price bid for the sidewalk or ramp. Excavation above the finished grade of the sidewalk or ramp will be measured and paid for in accordance with Section 2.02

3. Gravel or Reclaimed Miscellaneous Aggregate Base: This work will not be measured for payment, but the cost shall be considered as included in the price bid for the sidewalk or ramp.

4. Detectable Warning Strip: For new construction (cast in place), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

5. Retrofit Detectable Warning Strip: For retrofit construction (surface applied), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

6. Construction Staking: The establishment of control points and limits of grading will be measured in accordance with the item Construction Staking.

9.21.05—Basis of Payment: Construction of a concrete sidewalk or ramp will be paid for at the contract unit price per square foot for "Concrete Sidewalk," or "Concrete Sidewalk Ramp" complete in place, which price shall include all excavation as specified above, backfill, disposal of surplus material, curb removal and any monolithic or separately cast sidewalk curb when required for the sidewalk ramp as shown on the plans, gravel or reclaimed miscellaneous aggregate base, equipment, tools, materials and labor incidental thereto.

A new detectable warning strip will be paid for at the contract unit price for each ramp where the detectable warning strip has been installed complete in place. This price shall include all tiles, materials, equipment, tools and labor incidental thereto.

Retrofitting the existing concrete sidewalk with a detectable warning strip will be paid for at the contract unit price for each ramp where the retrofit detectable warning strip has been installed complete in place. This price will include all tiles, saw cutting concrete, adhesive, drilling holes for fasteners, materials, equipment, tools and labor incidental there to.

The establishment of control points and limits of grading will be paid for in accordance with the item Construction Staking.

Pay Item	Pay Unit
Concrete Sidewalk	s.f.
Concrete Sidewalk Ramp	s.f.
Detectable Warning Strip	Each
Retrofit Detectable Warning Strip	Each

SECTION 10.00 – GENERAL CLAUSES FOR HIGHWAY ILLUMINATION AND TRAFFIC SIGNAL PROJECTS

Article 10.00.10 Section 3. Functional Inspection, first paragraph after the 2nd sentence: Add the following:

The contractor shall have a bucket truck with crew on site during the Functional Inspection to make any necessary aerial signal adjustments as directed by the Engineer.

Article 10.00.12 - Negotiations with Utility Company: Add the following:

The contractor shall give notice to utility companies a minimum of 30 days prior to required work or services to the utility company. Refer to Section 1.07 – Legal Relations and Responsibilities for the list of utility companies and representatives the contractor shall use.

The Contractor shall perform all work in conformance with Rules and Regulations of Public Utility Regulatory Authority (PURA) concerning Traffic Signals attached to Public Service Company Poles. The Contractor is cautioned that there may be energized wires in the vicinity of the specified installations. In addition to ensuring compliance with NESC and OSHA regulations, the Contractor and/or its Sub-Contractors shall coordinate with the appropriate utility company for securing/protecting the site during the installation of traffic signal mast arms, span poles or illumination poles.

When a span is attached to a utility pole, the Contractor shall ensure the anchor is in line with the proposed traffic signal span wire. More than 5 degree deviation will lower the holding strength and is not allowed. The Contractor shall provide any necessary assistance required by the utility company, and ensure the anchor and guy have been installed and properly tensioned prior to attaching the span wire to the utility pole.

SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING

Description:

Work under this item shall conform to the requirements of Section 12.00 supplemented as follows:

12.00.06 – Data Labels:

For the purpose of developing and maintaining a highway sign inventory and for the purpose of sampling and testing reflective sheeting, the Contractor shall affix a Data Label(s) to the back of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign in the vicinity of the lower left hand corner or quadrant. Data Labels shall be 2 (two) separate 5 (five) inch by 3 (three) inch (125mm by 75mm), non-reflective weatherproof films with black copy on a yellow background having a pressure sensitive adhesive backing.

A “Fabrication” Data Label is to include information about the sign fabricator, date of fabrication and the sheeting manufacturer - type. An “Installation” Data Label is to include The State Project Number or Maintenance Permit Number that installed the sign and date of installation.

The cost of the data labels coded and in place on the sign shall be included in the unit cost of the respective sign material. Payment for the respective quantities of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign may be withheld until all Data Label(s) have been installed to the satisfaction of the Engineer.

The Data Label designs, with additional notes relative to design requirements are attached herewith.

12.00.07 – Global Positioning System (GPS) coordinates for signs:

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new permanent signs (temporary and construction signs are not to be included) installed in the project. The Engineer shall forward the sign data to the Division of Traffic Engineering. The horizontal datum is to be set to the State Plane Coordinate System, North American Datum of 1983 (NAD83) in feet. The minimum tolerance must be within 10 feet. The format of the GPS information shall be provided in a Microsoft Office compatible spreadsheet (Excel) file with data for each sign. The record for each sign installed is to be compatible with the anticipated CTDOT Sign Inventory and Management System (CTSIMS). The following format shall be used. However, the data fields noted by “#” are not required for the project submission. These entries will be completed as part of the Traffic Engineering CTSIMS data upload.

The cost of this work shall be included in the cost of the respective sign face – sheet aluminum and sign face – extruded aluminum items. The receipt of this electronic database must be received and accepted by the Engineer prior to final payment for items involving permanent highway signing. The electronic database information shall detail information regarding the sign actually installed by the project.

Field Number	Type	size	Description
1	text	20	Record Number (starting at 1...)
2	text	20	Sign Catalog Number
# 3	text	10	Size Height
# 4	text	10	Size Width
5	text	25	Legend
# 6	text	10	Background Color
# 7	text	10	Copy Color
8	Link	25	Material (see acceptable categories)
9	text	30	Comments if any
# 10	text	20	MUTCD Type
11	text	15	Town
12	text	5	Route
13	text	5	Route direction
# 14	text	10	Highway Log Mileage
15	text	15	Latitude
16	text	15	Longitude
17	text	25	Mounting Type
18	text	25	Reflective Sheeting Type
19	date	25	Date Installed
20	text	10	Number of Posts
21	text	255	Sheeting Manufacturer name and address
22	text	15	State Project Number (or)
23	text	15	Encroachment Permit number.
24	Graphic	*	Sign Picture Graphic.

* Graphics provided shall be representative of the sign supplied and be in color. Graphic formats shall be either JPG or TIFF and provided with a recommended pixel density of 800 x 600. The graphic shall be inserted in the supplied media in field 24 for each sign.

DATA LABELS
NON REFLECTIVE, WEATHERPROOF FILM
BLACK COPY, YELLOW BACKGROUND

CONN DOT SIGN FACE DATA LABEL											
Fabricator: (Insert NAME or State) Sheeting Manufacturer - Type (Insert NAME - TYPE)											
Date Fabricated - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

CONN DOT SIGN FACE DATA LABEL											
Installed By: Project No.: (Insert 000-0000 or State) Permit No.: (Insert D_-000000)											
Date Installed - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

Data Labels To Be 5 Inch By 3 Inch Each (125mm x 75mm) With Face Designs As Shown Above.

All Copy Ink Must Be Durable And Not Fade, Discolor, Or Smudge.

All Variable Legends To Be Included At Label Fabrication.

Only One "Installed By" Permit Or Project Number Should Be Provided.

Sign Fabrication And / Or Installation By State Forces, Insert "State."

The Month And Year Of Fabrication And Installation May Be Punched Or Marked Out

The Back Of The Data Label Must Contain A Pre-coated Pressure-Sensitive Adhesive Covered By A Removable Liner.

At Application, The Liner Must Be removable Without Soaking In Water Or Other Solvents.

The Adhesive Must Form A Durable Bond To Surfaces That Are Smooth, Clean, Corrosion-Free And Weather Resistant.

Completed Data Labels Must Not Discolor, Crack, Craze, Blister, Delaminate, Peel, Chalk, Or Lose Adhesion When Subjected To Temperatures From -30 Degrees to 200 Degrees Fahrenheit.

SECTION M.04 BITUMINOUS CONCRETE

Section M.04 is being deleted in its entirety and replaced with the following:

M.04.01—Bituminous Concrete Materials and Facilities

M.04.02—Mix Design and Job Mix Formula (JMF)

M.04.03—Production Requirements

M.04.01—Bituminous Concrete Materials and Facilities: Each source of material, and facility or plant used to produce and test bituminous concrete must be qualified on an annual basis by the Engineer. Test Procedures and Specifications referenced herein are in accordance with the latest AASHTO and ASTM Standard Test Procedures and Specifications. Such references when noted with an (M) have been modified by the Engineer and are detailed in Table M.04.03-7.

The Contractor shall submit to the Engineer all sources of coarse aggregate, fine aggregate, mineral filler, PG binder, and if applicable any additives such as but not limited to anti-strip, warm mix, and polymer modifiers. The Contractor shall submit a Safety Data Sheet (SDS) for each grade of binder, and additive to be used on the Project. The Contractor shall not change any material sources without prior approval of the Engineer.

An adequate quantity of each size aggregate, mineral filler, bitumen, and additives, shall be maintained at the bituminous concrete plant site at all times while the plant is in operation to ensure that the plant can consistently produce bituminous concrete mixtures that meet the job mix formula (JMF) as specified in Article M.04.02. The quantity of such material shall be reviewed by the Engineer on an individual plant basis and is dependent upon the plant's daily production capacity. A total quantity of any material on site that amounts to less than one day's production capacity may be cause for the job mix formula to be rejected.

1. Coarse Aggregate:

- a. **Requirements:** The coarse aggregate shall consist of clean, hard, tough, durable fragments of crushed stone or crushed gravel of uniform quality. Aggregates from multiple sources of supply must not be mixed or stored in the same stockpile.
- b. **Basis of Approval:** The request for approval of the source of supply shall include a washed sieve analysis in accordance with AASHTO T 27. The G_{sa}, G_{sb}, and P_{w_a} shall be determined in accordance with AASHTO T 85. The coarse aggregate must not contain more than 1% crusher dust, sand, soft disintegrated pieces, mud, dirt, organic and other injurious materials. When tested for abrasion using AASHTO T 96, the aggregate loss must not exceed 40%. When tested for soundness using AASHTO T 104 with a magnesium sulfate solution, the coarse aggregate must not have a loss exceeding 10% at the end of 5 cycles.

For all bituminous mixtures, materials shall also meet the coarse aggregate angularity criteria as specified in Tables M.04.02-2 thru M.04.02-4 for blended aggregates retained

on the #4 sieve when tested according to ASTM D 5821. The amount of aggregate particles of the coarse aggregate blend retained on the #4 sieve that are flat and elongated shall be determined in accordance with ASTM D 4791 and shall not exceed 10% by weight when tested to a 5:1 ratio, as shown in Tables M.04.02-2 thru M.04.02-4.

2. Fine Aggregate:

- a. **Requirements:** The fine aggregate from each source quarry/pit deposit shall consist of clean, hard, tough, rough-surfaced and angular grains of natural sand; manufactured sand prepared from washed stone screenings; stone screenings, slag or gravel; or combinations thereof, after mechanical screening or manufactured by a process approved by the Engineer. The Contractor is prohibited from mixing two or more sources of fine aggregate on the ground for the purpose of feeding into a plant.

All fine aggregate shall meet the listed criteria shown in items #1 thru #7 of Table M.04.01-1. Table M.04.01-1 indicates the quality tests and criteria required for all fine aggregate sources. Individually approved sources of supply shall not be mixed or stored in the same stockpile. The fine aggregates must be free from injurious amounts of clay, loam, and other deleterious materials.

For Superpave mixtures, in addition to the above requirements, the fine aggregate angularity shall be determined by testing the materials passing the #8 sieve in accordance with AASHTO T 304, Method A. Qualification shall be based on the criteria listed in Tables M.04.02-2 thru M.04.02-4. The fine aggregate shall also be tested for clay content as a percentage contained in materials finer than the #8 sieve in accordance with AASHTO T 176.

TABLE M.04.01-1: Fine Aggregate Criteria by Pit/Quarry Source

Item	Title	AASHTO Protocol(s)	Criteria
1	Grading	T 27 & T 11	100% Passing 3/8 inch 95% Passing the #4 min.
2	Absorption	T 84	3% maximum
3	Plasticity limits	T 90	0 or not detectable
4	L.A. Wear	T 96	50% maximum(fine agg. particle size # 8 and above)
5	Soundness by Magnesium Sulfate	T 104	20% maximum @ 5 cycles
6	Clay Lumps and Friable Particles	T 112	3% maximum
7	Deleterious Material	As determined by the Engineer	Organic or inorganic calcite, hematite, shale, clay or clay lumps, friable materials, coal-lignite, shells, loam, mica, clinkers, or organic matter (wood, etc). -Shall not contain more than 3% by mass of any individual listed constituent and not more than 5% by mass in total of all listed constituents.
8	Petrographic Analysis	ASTM C 295	Terms defined in Section M.04.01-2c.

b. Basis of Approval: A Quality Control Plan for Fine Aggregate (QCPFA) provided by the Contractor shall be submitted for review and approval for each new source documenting how conformance to Items 1 through 7 as shown in Table M.04.01-1 is monitored. The QCPFA must be resubmitted any time the process, location or manner of how the fine aggregate (FA) is manufactured changes, or as requested by the Engineer. The QCPFA must include the locations and manufacturing processing methods. The QCPFA for any source may be suspended by the Engineer due to the production of inconsistent material.

The Contractor shall submit all test results to the Engineer for review. The Contractor shall also include a washed sieve analysis in accordance with AASHTO T 27/T 11. Any fine aggregate component or final combined product shall have 100% passing the 3/8 inch sieve and a minimum of 95% passing the # 4. The G_{sa}, G_{sb}, and P_{wa} shall be determined in accordance with AASHTO T 84.

The Contractor will be notified by the Engineer if any qualified source of supply fails any portion of Table M.04.01-1. One retest will be allowed for the Contractor to make corrections and/or changes to the process. If, upon retest, the material does not meet the requirements of items 1-7, additional testing will be required in accordance with item 8.

The Contractor may provide a Petrographic analysis of the material performed by a third party acceptable to the Engineer at its' own expense. The Contractor shall submit the results of the analysis with recommended changes to the manufacturing process to the Engineer. The Contractor shall submit fine aggregate samples for testing by the Engineer after the recommended changes have been made.

The Contractor may request the use of such fine aggregate on select project(s) for certain applications of bituminous concrete pavement. Such material will be monitored for a period no less than 48 months, at no cost to the State. Terms of any evaluation and suitable application will be determined by the Engineer.

3. Mineral Filler:

- a. Requirements: Mineral filler shall consist of finely divided mineral matter such as rock dust, including limestone dust, slag dust, hydrated lime, hydraulic cement, or other accepted mineral matter. At the time of use it shall be freely flowing and devoid of agglomerations. Mineral filler shall be introduced and controlled at all times during production in a manner acceptable to the Engineer.
- b. Basis of Approval: The request for approval of the source of supply shall include the location, manufacturing process, handling and storage methods for the material. Mineral filler shall conform to the requirements of AASHTO M 17.

4. Performance Graded Asphalt Binder:

a. General:

- i Liquid PG binders shall be uniformly mixed and blended and be free of contaminants such as fuel oils and other solvents. Binders shall be properly heated and stored to prevent damage or separation.
- ii. The blending at mixing plants of PG binder from different suppliers is strictly prohibited. Contractors who blend PG binders will be classified as a supplier and will be required to certify the binder in accordance with AASHTO R 26(M). The binder shall meet the requirements of AASHTO M 332 and shall be graded or verified in accordance with AASHTO R 29. The Contractor shall submit a Certified Test Report and bill of lading representing each delivery in accordance with AASHTO R 26(M). The Certified Test Report must also indicate the binder specific gravity at 77°F; rotational viscosity at 275°F and 329°F and the mixing and compaction viscosity-temperature chart for each shipment.
- iii. The Contractor shall submit the name(s) of personnel responsible for receipt, inspection, and record keeping of PG binder materials. Contractor plant personnel shall document specific storage tank(s) where binder will be transferred and stored until used, and provide binder samples to the Engineer upon request. The person(s) shall assure that each shipment (tanker truck) is accompanied by a statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped and that the binder will be free of contamination from any residual material, along with two (2) copies of the bill of lading.
- iv. Basis of Approval: The request for approval of the source of supply shall list the location where the material will be manufactured, and the handling and storage methods, along with necessary certification in accordance with AASHTO R 26(M). Only suppliers/refineries that have an approved "Quality Control Plan for Performance Graded Binders" formatted in accordance with AASHTO R 26(M) will be allowed to supply PG binders to Department projects.

b. Neat Performance Grade (PG) Binder:

- i. PG binder shall be classified by the supplier as a "Neat" binder for each lot and be so labeled on each bill of lading. Neat PG binders shall be free from modification with: fillers, extenders, reinforcing agents, adhesion promoters, thermoplastic polymers, acid modification and other additives such as re-refined motor oil, and shall indicate such information on each bill of lading and certified test report.
- ii. The asphalt binder shall be PG 64S-22.

c. Modified Performance Grade (PG) Binder:

Unless otherwise noted, the asphalt binder shall be Performance Grade PG 64E-22 asphalt modified solely with a Styrene-Butadiene-Styrene (SBS) polymer. The polymer modifier shall be added at either the refinery or terminal and delivered to the bituminous concrete production facility as homogenous blend. The stability of the

modified binder shall be verified in accordance with ASTM D7173 using the Dynamic Shear Rheometer (DSR). The DSR $G^*/\sin(\delta)$ results from the top and bottom sections of the ASTM D7173 test shall not differ by more than 10%. The results of ASTM D7173 shall be included on the Certified Test Report. The binder shall meet the requirements of AASHTO M 332 (including Appendix X1) and AASHTO R 29.

d. Warm Mix Additive or Technology:

- i. The warm mix additive or technology must be listed on the NEAUPG Qualified Warm Mix Asphalt (WMA) Technologies List at the time of bid, which may be accessed online at http://www.neaupg.uconn.edu/wma_info.html.
- ii. The warm mix additive shall be blended with the asphalt binder in accordance with the manufacturer's recommendations.
- iii. The blended binder shall meet the requirements of AASHTO M 332 and shall be graded or verified in accordance with AASHTO R 29 for the specified binder grade. The Contractor shall submit a Certified Test Report showing the results of the testing demonstrating the binder grade. In addition, it must include the grade of the virgin binder, the brand name of the warm mix additive, the manufacturer's suggested rate for the WMA additive, the water injection rate (when applicable) and the WMA Technology manufacturer's recommended mixing and compaction temperature ranges.

5. Emulsified Asphalts:

a. General:

- i. Emulsified asphalts shall be homogeneous and be free of contaminants such as fuel oils and other solvents. Emulsions shall be properly stored to prevent damage or separation.
- ii. The blending at mixing plants of emulsified asphalts from different suppliers is strictly prohibited. Contractors who blend emulsified asphalts will be classified as a supplier and will be required to certify the emulsion in accordance with AASHTO PP 71. The emulsified asphalt shall meet the requirements of AASHTO M 140(M) or AASHTO M 208 as applicable.

b. Supplier Approval:

- i. The request for approval of the source of supply shall list the location where the material is manufactured, the handling and storage methods, and certifications in accordance with AASHTO PP 71. Only suppliers that have an approved "Quality Control Plan for Emulsified Asphalt" formatted in accordance with AASHTO PP 71 will be allowed to supply emulsified asphalt to Department projects.
- ii. The supplier shall submit to the Division Chief a Certified Test Report representing each lot in accordance with AASHTO PP 71. The Certified Test Report shall include test results for each specified requirement for the grade delivered and shall also indicate the density at 60°F. Additionally, once a month one split sample for each emulsified asphalt grade shall be submitted.

c. Basis of Approval

- i. Each shipment of emulsified asphalt delivered to the project site shall be accompanied with the corresponding SDS and Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon at 60°F.
- ii. Anionic emulsified asphalts shall conform to the requirements of AASHTO M-140(M). Materials used for tack coat shall not be diluted and meet grade RS-1 or RS-1H. When ambient temperatures are 80°F and rising, grade SS-1 or SS-1H may be substituted if permitted by the Engineer.
- iii. Cationic emulsified asphalt shall conform to the requirements of AASHTO M-208. Materials used for tack coat shall not be diluted and meet grade CRS-1. The settlement and demulsibility test will not be performed unless deemed necessary by the Engineer. When ambient temperatures are 80°F and rising, grade CSS-1 or CSS-1h may be substituted if permitted by the Engineer.

6. Reclaimed Asphalt Pavement (RAP):

- a. Requirements: RAP shall consist of asphalt pavement constructed with asphalt and aggregate reclaimed by cold milling or other removal techniques approved by the Engineer. For bituminous concrete mixtures containing RAP, the Contractor shall submit a JMF in accordance with Article M.04.02 to the Engineer for review.
- b. Basis of Approval: The RAP material will be accepted on the basis of one of the following criteria:
 - i. When the source of all RAP material is from pavements previously constructed on Department projects, the Contractor shall provide a materials certificate listing the detailed locations and lengths of those pavements and that the RAP is only from those locations listed.
 - ii. When the RAP material source or quality is not known, the Contractor shall test the material and provide the following information along with a request for approval to the Engineer at least 30 calendar days prior to the start of the paving operation. The request shall include a material certificate stating that the RAP consists of aggregates that meet the specification requirements of sub articles M.04.01-1 through 3 and that the binder in the RAP is substantially free of solvents, tars and other contaminants. The Contractor is prohibited from using unapproved material on Department projects and shall take necessary action to prevent contamination of approved RAP stockpiles. Stockpiles of unapproved material shall remain separate from all other RAP materials at all times. The request for approval shall include the following:
 1. A 50-pound sample of the RAP to be incorporated into the recycled mixture.
 2. A 25-pound sample of the extracted aggregate from the RAP.
 3. A statement that RAP material has been crushed to 100% passing the ½ inch sieve and remains free from contaminants such as joint compound, wood, plastic, and metals.

7. Crushed Recycled Container Glass (CRCG):

- a. Requirements: The Contractor may propose to use clean and environmentally-acceptable CRCG in an amount not greater than 5% by weight of total aggregate.
- b. Basis of Approval: The Contractor shall submit to the Engineer a request to use CRCG. The request shall state that the CRCG contains no more than 1% by weight of contaminants such as paper, plastic and metal and conform to the following gradation:

CRCG Grading Requirements	
<u>Sieve Size</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	35-100
No. 200	0.0-10.0

8. Joint Seal Material:

- a. Requirements: Joint seal material shall be a hot-poured rubber compound intended for use in sealing joints and cracks in bituminous concrete pavements. Joint seal material must meet the requirements of ASTM D 6690 – Type 2.

9. Recycled Asphalt Shingles (RAS)

- a. Requirements: RAS shall consist of processed asphalt roofing shingles from post-consumer asphalt shingles or from manufactured shingle waste. The RAS material under consideration for use in bituminous concrete mixtures must be certified as being asbestos free and shall be entirely free of whole, intact nails. The RAS material shall meet the requirements of AASHTO MP 23.

The producer shall test the RAS material to determine the asphalt content and the gradation of the RAS material. The producer shall take necessary action to prevent contamination of RAS stockpiles.

10. Plant Requirements:

- a. Mixing Plant and Machinery: The mixing plant used in the preparation of the bituminous concrete shall comply with AASHTO M 156/ASTM D 995 for a Batch Plant or a Drum Dryer Mixer Plant, and be approved by the Engineer.

- b. Storage Silos: For all mixes, the Contractor may use silos for short-term storage of Superpave mixtures with prior notification and approval of the Engineer. A silo must have heated cones and an unheated silo cylinder if it does not contain a separate internal heating system. Prior approval must be obtained for storage times greater than those indicated. When multiple silos are filled, the Contractor shall discharge one silo at a time. Simultaneous discharge of multiple silos is not permitted.

<u>Type of silo cylinder</u>	<u>Maximum storage time for all classes (hr)</u>	
	HMA	WMA/PMA
Open Surge	4	Mfg Recommendations
Unheated – Non-insulated	8	Mfg Recommendations
Unheated – Insulated	18	Mfg Recommendations
Heated – No inert gas	TBD by the Engineer	

- c. Documentation System: The mixing plant documentation system shall include equipment for accurately proportioning the components of the mixture by weight and in the proper order, controlling the cycle sequence and timing the mixing operations. Recording equipment shall monitor the batching sequence of each component of the mixture and produce a printed record of these operations on each delivery ticket, as specified herein. Material feed controls shall be automatically or manually adjustable to provide proportions within the tolerances listed below for any batch size.

An asterisk (*) shall be automatically printed next to any individual batch weight(s) exceeding the tolerances in ASTM D 995 section 8.7.3. The entire batching and mixing interlock cut-off circuits shall interrupt and stop the automatic batching operations when an error exceeding the acceptable tolerance occurs in proportioning.

There must be provisions so that scales are not manually adjusted during the printing process. In addition, the system shall be interlocked to allow printing only when the scale has come to a complete rest. A unique printed character (m) shall automatically be printed on the truck and batch plant printout when the automatic batching sequence is interrupted or switched to auto-manual or full manual during proportioning. For each day's production, each project shall be provided a clear, legible copy of these recordings on each delivery ticket.

- d. Aggregates: The Contractor shall ensure that aggregate stockpiles are managed to provide uniform gradation and particle shape, prevent segregation and cross contamination in a manner acceptable to the Engineer. For drum plants only, the Contractor shall determine the percent moisture content at a minimum, prior to production and half way through production.
- e. Mixture: The dry and wet mix times shall be sufficient to provide proper coating (minimum 95% as determined by AASHTO T 195(M)) of all particles with bitumen and produce a uniform mixture.

The Contractor shall make necessary adjustments to ensure all types of bituminous concrete mixtures contain no more than 0.5% moisture throughout when tested in accordance with AASHTO T 329.

- f. RAP: The Contractor shall indicate the percent of RAP, the moisture content (as a minimum determined twice daily prior to production and halfway through production), and the net dry weight of RAP added to the mixture on each delivery ticket. For each day of production, the production shall conform to the job mix formula and RAP percentage and no change shall be made without the prior approval of the Engineer.
- g. Asphalt Binder: The last day of every month, a binder log shall be submitted when the monthly production for the Department exceeds 5000 tons. Blending of PG binders from different suppliers or grades at the bituminous concrete production facility is strictly prohibited.
- h. Warm mix additive: For mechanically foamed WMA, the maximum water injection rate shall not exceed 2.0% water by total weight of binder and the water injection rate shall be constantly monitored during production.
- i. Field Laboratory: The Contractor shall furnish the Engineer an acceptable field laboratory at the production facility to test bituminous concrete mixtures during production. The field laboratory shall have a minimum of 300 square feet, have a potable water source and drainage in accordance with the CT Department of Public Health Drinking Water Division, and be equipped with all necessary testing equipment as well as with a PC, printer, and telephone with a dedicated hard-wired phone line. In addition, the PC shall have a high speed internet connection with a minimum upstream of 384 Kbps and a functioning web browser with unrestricted access to <https://ctmail.ct.gov>. This equipment shall be maintained in clean and good working order at all times and be made available for use by the Engineer.

The laboratory shall be equipped with a suitable heating system capable of maintaining a minimum temperature of 65°F. It shall be clean and free of all materials and equipment not associated with the laboratory. Windows shall be installed to provide sufficient light and ventilation. During summer months adequate cooling or ventilation must be provided so the indoor air temperature shall not exceed the ambient outdoor temperature. Light fixtures and outlets shall be installed at convenient locations, and a telephone shall be within audible range of the testing area. The laboratory shall be equipped with an adequate workbench that has a suitable length, width, and sampling tables, and be approved by the Engineer.

The field laboratory testing apparatus, supplies, and safety equipment shall be capable of performing all tests in their entirety that are referenced in AASHTO R 35, *Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA)* and AASHTO M 323, *Standard Specification for Superpave Volumetric Mix Design*. In addition, the quantity of all equipment and supplies necessary to perform the tests must be sufficient to

initiate and complete the number of tests identified in Table M.04.03-2 for the quantity of mixture produced at the facility on a daily basis. The Contractor shall ensure that the Laboratory is adequately supplied at all times during the course of the project with all necessary testing materials and equipment.

The Contractor shall maintain a list of laboratory equipment used in the acceptance testing processes including but not limited to, balances, scales, manometer/vacuum gauge, thermometers, gyratory compactor, clearly showing calibration and/or inspection dates, in accordance with AASHTO R 18. The Contractor shall notify the Engineer if any modifications are made to the equipment within the field laboratory. The Contractor shall take immediate action to replace, repair, and/or recalibrate any piece of equipment that is out of calibration, malfunctioning, or not in operation.

M.04.02—Mix Design and Job Mix Formula (JMF)

1. Curb Mix:

- a. Requirements: When curb mix is specified, the Contractor shall develop a bituminous concrete mix design that includes a JMF consisting of target values for gradation, binder content and air voids as shown in Table M.04.02-1. The Contractor may use RAP in 5% increments up to a maximum of 30% provided a new JMF is accepted by the Engineer.
- b. Basis of Approval: The Contractor shall submit to the Engineer a request for approval of the JMF annually in accordance with one of the methods described herein. Prior to the start of any paving operations, the JMF must be accepted by the Engineer, and the Contractor must demonstrate the ability to meet the accepted JMF. Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%.

The Contractor shall test the mixture for compliance with the submitted JMF and Table M.04.02-1. The maximum theoretical density (Gmm) will be determined by AASHTO T 209. If the mixture does not meet the requirements, the JMF shall be adjusted within the ranges shown in Table M.04.02-1 until an acceptable mixture is produced.

An accepted JMF from the previous operating season may be acceptable to the Engineer provided that there are no changes in the sources of supply for the coarse aggregate, fine aggregate, recycled material (if applicable) and the plant operation had been consistently producing acceptable mixture.

The Contractor shall not change sources of supply after a JMF has been accepted. Before a new source of supply for materials is used, a new JMF shall be submitted to the Engineer for approval.

**TABLE M.04.02 – 1:
Master Ranges for Curb Mix Mixtures**

Notes: (a) Compaction Parameter 50gyration N_{des} . (b) The percent passing the #200 sieve shall not exceed the percentage of bituminous asphalt binder determined by AASHTO T 164 or AASHTO T 308.

Mix	Curb Mix	Production Tolerances from JMF target
Grade of PG Binder content %	PG 64S-22 6.5 - 9.0	0.4
Sieve Size		
# 200	3.0 – 8.0 (b)	2.0
# 50	10 - 30	4
# 30	20 - 40	5
# 8	40 - 70	6
# 4	65 - 87	7
1/4"		
3/8 "	95 - 100	8
1/2 "	100	8
3/4"		8
1"		
2"		
Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%		
Mixture Temperature		
Binder	325°F maximum	
Aggregate	280-350° F	
Mixtures	265-325° F	
Mixture Properties		
VOIDS %	0 – 4.0 (a)	

2. Superpave Design Method – S0.25, S0.375, S0.5, and S1

- a. Requirements: The Contractor or its representative shall design and submit Superpave mix designs annually for approval. The design laboratory developing the mixes shall be approved by the Engineer. The mix design shall be based on the specified Equivalent Single-Axle Loads (ESAL). Each bituminous concrete mix type must meet the requirements shown in Tables M.04.02-2 thru Table M.04.02-5 and in accordance with AASHTO M 323 and AASHTO R 35. The mix design shall include the nominal maximum aggregate size and a JMF consisting of target values for gradation and bitumen content for each bituminous concrete mix type designated for the project.

The contractor shall provide test results with supporting documentation from an AASHTO Materials Reference Laboratory (AMRL) with the use of NETTCP Certified Technicians for the following tests:

1. Aggregate consensus properties for each type & level, as specified in Table M.04.02-3 and the specific gravity data.
2. Extracted aggregates from RAP aggregate, when applicable, consensus properties for each type & level, as specified in Table M.04.02-3 and the specific gravity data.
3. New mixes shall be tested in accordance with AASHTO T 283(M) *Standard Method of Test for Resistance of Compacted Hot-Mix Asphalt (HMA) to Moisture-Induced Damage*, (TSR). The compacted specimens may be fabricated at a bituminous concrete facility and then tested at an AMRL accredited facility.

The AASHTO T 283(M) test results, specimens, and corresponding JMF sheet (Form MAT-429s) shall be submitted by the Contractor for review.

In addition, minimum binder content values apply to all types of bituminous concrete mixtures, as stated in Table M.04.02-5. For mixtures containing RAP, the virgin production and the anticipated proportion of binder contributed by the RAP cannot be less than the total permitted binder content value for that type nor the JMF minimum binder content.

- i. Superpave Mixture (virgin): For bituminous concrete mixtures that contain no recycled material, the limits prescribed in Tables M.04.02-2 thru Table M.04.02-5 apply. The Contractor shall submit a JMF, on a form provided by the Engineer, with the individual fractions of the aggregate expressed as percentages of the total weight of the mix and the source(s) of all materials to the Engineer for approval. The JMF shall indicate the corrected target binder content and applicable binder correction factor (ignition oven or extractor) for each mix type by total weight of mix. The mineral filler (dust) shall be defined as that portion of blended mix that passes the #200 sieve by weight when tested in accordance with AASHTO T 30. The dust-to-effective asphalt (D/Pbe) ratio shall be between 0.6 and 1.2 by weight. The dry/wet mix times and hot bin proportions (batch plants only) for each type shall be included in the JMF.

The percentage of aggregate passing each sieve shall be plotted on a 0.45 power gradation chart and shall be submitted for all bituminous concrete mixtures. This chart shall delineate the percentage of material passing each test sieve size as defined by the JMF. The percentage of aggregate passing each standard sieve shall fall within the specified control points as shown in Tables M.04.02-2 thru Table M.04.02-5. A change in the JMF requires that a new chart be submitted.

- ii. Superpave Mixtures with RAP: Use of approved RAP may be allowed with the following conditions:
- RAP amounts up to 15% may be used with no binder grade modification.
 - RAP amounts up to 20% may be used provided a new JMF is approved by the Engineer. The JMF submittal shall include the grade of virgin binder added. The JMF shall be accompanied by a blending chart and supporting test results in accordance with AASHTO M 323 Appendix X1, or by test results that show the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
 - Two representative samples of RAP shall be obtained. Each sample shall be split and one split sample shall be tested for binder content in accordance with AASHTO T 164 and the other in accordance AASHTO T 308.

Unless approved by the Engineer, RAP material shall not be used with any other recycling option.

- iii. Superpave Mixtures with RAS: Use of RAS may be allowed solely in HMA S1 mixtures with the following conditions:
- RAS amounts up to 3% may be used.
 - RAS total binder replacement up to 15% may be used with no binder grade modification.
 - RAS total binder replacement up to 20% may be used provided a new JMF is approved by the Engineer. The JMF submittal shall include the grade of virgin binder added. The JMF shall be accompanied by a blending chart and supporting test results in accordance to AASHTO M 323 appendix X1 or by test results that show the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
 - Superpave Mixtures with RAS shall meet AASHTO PP 78 design considerations. The RAS asphalt binder availability factor (F) used in AASHTO PP 78 Equation 2 shall be 0.85.
- iv. Superpave Mixtures with CRCG: In addition to the requirements in M.04.02 – 2 a through c, for bituminous concrete mixtures that contain CRCG, the Contractor shall submit a materials certificate to the Engineer stating that the CRCG complies with requirements stated in Article M.04.01, as applicable. Additionally, 1% hydrated lime, or other accepted non-stripping agent, shall be added to all mixtures containing CRCG. CRCG material shall not be used with any other recycling option.

- b. Basis of Approval: On an annual basis, the Contractor shall submit to the Engineer any bituminous concrete mix design, and JMF anticipated for use on Department projects. Prior to the start of any paving operations, the mix design and JMF must be approved by the Engineer. Bituminous concrete mixture supplied to the project without an approved mix design and JMF will be rejected. The following information must be included in the mix design submittal:
- i. Gradation, consensus properties and specific gravities of the aggregate, RAP, and RAS.
 - ii. Average asphalt content of the RAP and RAS by AASHTO T 164.
 - iii. Source of RAP and RAS and percentage to be used.
 - iv. Warm mix Technology and manufacturer's recommended additive rate and tolerances.
 - v. TSR test report, and, if applicable, anti-strip manufacturer and recommended dosage rate.
 - vi. Mixing and compaction temperature ranges for the mix with and without the warm-mix technology incorporated.
 - vii. JMF ignition oven correction factor by AASHTO T 308.

The JMF shall be accepted if the Plant mixture and materials meet all criteria as specified in Tables M.04.02-2 thru Table M.04.02-5. If the mixture does not meet the requirements, the contractor shall adjust the JMF within the ranges shown in Tables M.04.02-2 thru Table M.04.02-5 until an acceptable mixture is produced. All equipment, tests, and computations shall conform to the latest AASHTO R 35 and AASHTO M 323.

Any JMF, once approved, shall only be acceptable for use when it is produced by the designated plant, it utilizes the same component aggregates and binder source, and it continues to meet all criteria as specified herein, and component aggregates are maintained within the tolerances shown in Table M.04.02-2.

The Contractor shall not change any component source of supply including consensus properties after a JMF has been accepted. Before a new source of materials is used, a revised JMF shall be submitted to the Engineer for approval. Any approved JMF applies only to the plant for which it was submitted. Only one mix with one JMF will be approved for production at any one time. Switching between approved JMF mixes with different component percentages or sources of supply is prohibited.

- c. Mix Status: Each facility will have each type of bituminous concrete mixture evaluated based on the previous year of production, for the next construction paving season, as determined by the Engineer. Based on the rating a type of mixture receives it will determine whether the mixture can be produced without the completion of a PPT. Ratings will be provided to each bituminous concrete producer annually prior to the beginning of the paving season.

The rating criteria are based on compliance with Air Voids and Voids in Mineral Aggregate (VMA) as indicated in Table M.04.03-3: *Superpave Master Range for Bituminous Concrete Mixture Production*, and are as follows:

Criteria A: Based on Air Voids. Percentage of acceptance results with passing air voids.

Criteria B: Based on Air Voids and VMA. The percentage of acceptance results with passing VMA, and the percentage of acceptance results with passing air voids, will be averaged.

The final rating assigned will be the lower of the rating obtained with Criteria A or Criteria B.

Ratings are defined as:

“A” – Approved:

A rating of “A” is assigned to each mixture type from a production facility with a current rating of 70% passing or greater.

“PPT” – Pre-Production Trial:

Rating assigned to each mixture type from a production facility when:

1. there are no passing acceptance production results submitted to the Department from the previous year;
2. there is a source change in one or more aggregate components from the JMF on record by more than 10% by weight;
3. there is a change in RAP percentage;
4. the mixture has a rating of less than 70% from the previous season;
5. a new JMF not previously submitted.

Bituminous concrete mixtures rated with a “PPT” cannot be shipped or used on Department projects. A passing “PPT” test shall be performed with NETTCP certified personnel on that type of mixture by the bituminous concrete producer and meet all specifications (Table M.04.02-2 Table M.04.02-5) before production shipment may be resumed.

Contractors that have mix types rated as “PPT” may use one of the following methods to change the rating to an “A.”

Option A: Schedule a day when a Department inspector can be at the facility to witness a passing “PPT” test or,

Option B: When the Contractor or their representative performs a “PPT” test without being witnessed by an inspector, the Contractor shall submit the test results and a split sample including 2 gyratory molds, 5,000 grams of boxed bituminous concrete for binder and gradation determination, and 5,000 grams of cooled loose bituminous concrete for Gmm determination for verification testing and approval. Passing verifications will designate the bituminous concrete type to

be on an “A” status. Failing verifications will require the contractor to submit additional trials.

Option C: When the Contractor or their representative performs a “PPT” test without being witnessed by a Department inspector, the Engineer may verify the mix in the Contractor’s laboratory. Passing verifications will designate the bituminous concrete type to be an “A” status. Failing verifications will require the Contractor to submit additional trials.

When Option (A) is used and the “PPT” test meets all specifications, the “PPT” test is considered a passing test and the rating for that mix is changed to “A”. When the “PPT” test is not witnessed, the “PPT” Option (B) or (C) procedure must be followed. If the “PPT” Option (B) procedure is followed, the mixtures along with the test results must be delivered to the Materials Testing Lab. The test results must meet the “C” tolerances established by the Engineer. The tolerance Table is included in the Department’s current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures.

“U” – No Acceptable Mix Design on File:

Rating assigned to a type of mixture that does not have a JMF submitted, or the JMF submitted has not been approved, or is incomplete. A mix design or JMF must be submitted annually seven (7) days prior in order to obtain an “A,” or “PPT” status for that mix. A “U” will be used only to designate the mix status until the mix design has been approved, and is accompanied with all supporting data as specified. Bituminous concrete mixtures rated with a “U” cannot be used on Department projects.

TABLE M.04.02– 2: Superpave Master Range for Bituminous Concrete Mixture Design Criteria

Notes: ⁽¹⁾ Minimum Pb as specified in Table M.04.02-5. ⁽²⁾ Voids in Mineral Aggregates shall be computed as specified in AASHTO R 35. ⁽³⁾ Control point range is also defined as the master range for that mix. ⁽⁴⁾ Dust is considered to be the percent of materials passing the #200 sieve. ⁽⁵⁾ For WMA, lower minimum aggregate temperature will require Engineer's approval. ⁽⁶⁾ For WMA and PMA, the mix temperature shall meet manufacturer's recommendations.								
	S0.25		S0.375		S0.5		S1	
Sieve	CONTROL POINTS ⁽³⁾		CONTROL POINTS ⁽³⁾		CONTROL POINTS ⁽³⁾		CONTROL POINTS ⁽³⁾	
inches	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
2.0	-	-	-	-	-	-	-	-
1.5	-	-	-	-	-	-	100	-
1.0	-	-	-	-	-	-	90	100
3/4	-	-	-	-	100	-	-	90
1/2	100	-	100	-	90	100	-	-
3/8	97	100	90	100	-	90	-	-
#4	-	90	-	90	-	-	-	-
#8	32	67	32	67	28	58	19	45
#16	-	-	-	-	-	-	-	-
#30	-	-	-	-	-	-	-	-
#50	-	-	-	-	-	-	-	-
#100	-	-	-	-	-	-	-	-
#200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0
Pb ⁽¹⁾	-	-	-	-	-	-	-	-
VMA ⁽²⁾ (%)	16.0 ± 1		16.0 ± 1		15.0 ± 1		13.0 ± 1	
VA (%)	4.0 ± 1		4.0 ± 1		4.0 ± 1		4.0 ± 1	
Gse	JMF value		JMF value		JMF value		JMF value	
Gmm	JMF ± 0.030		JMF ± 0.030		JMF ± 0.030		JMF ± 0.030	
Dust/Pbe ⁽⁴⁾	0.6 – 1.2		0.6 – 1.2		0.6 – 1.2		0.6 – 1.2	
Agg. Temp ⁽⁵⁾	280 – 350°F		280 – 350°F		280 – 350°F		280 – 350°F	
Mix Temp ⁽⁶⁾	265 – 325°F		265 – 325°F		265 – 325°F		265 – 325°F	
Design TSR	> 80%		> 80%		> 80%		> 80%	
T-283 Stripping	Minimal, as determined by the Engineer							

TABLE M.04.02–3: Superpave Master Range for Consensus Properties of Combined Aggregate Structures

Notes: (1) If less than 25 % of a given layer is within 4 inches of the anticipated top surface, the layer may be considered to be below 4 inches for mixture design purposes.					
Traffic Level	Design ESALs (80 kN)	Coarse Aggregate Angularity ⁽¹⁾ ASTM D 5821	Fine Aggregate Angularity ⁽⁷⁾ AASHTO T 304	Flat and Elongated Particles ASTM D 4791	Sand Equivalent AASHTO T 176
-----	(million)			> #4	-----
1*	< 0.3	55/- -	40	10	40
2	0.3 to < 3.0	75/- -	40	10	40
3	≥ 3.0	95/90	45	10	45
	Design ESALs are the anticipated project traffic level expected on the design lane, projected over a 20 year period, regardless of the actual expected design life of the roadway.	Criteria presented as minimum values. 95/90 denotes that a minimum of 95% of the coarse aggregate, by mass, shall have one fractured face and that a minimum of 90% shall have two fractured faces.	Criteria presented as minimum percent air voids in loosely compacted fine aggregate passing the #8 sieve.	Criteria presented as maximum Percent by mass of flat and elongated particles of materials retained on the #4 sieve, determined at 5:1 ratio.	Criteria presented as minimum values for fine aggregate passing the #8 sieve.

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

TABLE M.04.02– 4: Superpave Master Range for Traffic Levels and Design Volumetric Properties

Traffic Level	Design ESALs	Number of Gyration by Superpave Gyratory Compactor			Percent Density of Gmm from HMA/WMA specimen			Voids Filled with Asphalt (VFA) Based on Nominal mix size – inch			
	(million)	Nini	Ndes	Nmax	Nini	Ndes	Nmax	0.25	0.375	0.5	1
1*	< 0.3	6	50	75	≤ 91.5	96.0	≤ 98.0	70 - 80	70 - 80	70 - 80	67 - 80
2	0.3 to < 3.0	7	75	115	≤ 90.5	96.0	≤ 98.0	65 - 78	65 - 78	65 - 78	65 - 78
3	≥ 3.0	8	100	160	≤ 90.0	96.0	≤ 98.0	73 – 76	73 - 76	65 - 75	65 - 75

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

TABLE M.04.02– 5:
Superpave Minimum Binder Content by Mix Type and Level

Mix Type	Level	Binder Content Minimum ⁽¹⁾
S0.25	1*	5.6
S0.25	2	5.5
S0.25	3	5.4
S0.375	1*	5.6
S0.375	2	5.5
S0.375	3	5.4
S0.5	1*	5.0
S0.5	2	4.9
S0.5	3	4.8
S1	1*	4.6
S1	2	4.5
S1	3	4.4

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

M.04.03— Production Requirements:

1. Standard Quality Control Plan (QCP) for Production:

The QCP for production shall describe the organization and procedures which the Contractor shall use to administer quality control. The QCP shall include the procedures used to control the production process, to determine when immediate changes to the processes are needed, and to implement the required changes. The QCP must detail the inspection, sampling and testing protocols to be used, and the frequency for each.

Control Chart(s) shall be developed and maintained for critical aspect(s) of the production process as determined by the Contractor. The control chart(s) shall identify the material property, applicable upper and lower control limits, and be updated with current test data. As a minimum, the following quality characteristics shall be included in the control charts: percent passing #4 sieve, percent passing #200 sieve, binder content, air voids, Gmm and VMA. The control chart(s) shall be used as part of the quality control system to document variability of the bituminous concrete production process. The control chart(s) shall be submitted to the Engineer the first day of each month.

The QCP shall also include the name and qualifications of a Quality Control Manager. The Quality Control Manager shall be responsible for the administration of the QCP, including compliance with the plan and any plan modifications.

The Contractor shall submit complete production testing records to the Engineer within 24 hours in a manner acceptable to the Engineer.

The QCP shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor. The QCP must also include a list of sampling & testing methods and frequencies used during production, and the names of all Quality Control personnel and their duties.

Approval of the QCP does not imply any warranty by the Engineer that adherence to the plan will result in production of bituminous concrete that complies with these specifications. The Contractor shall submit any changes to the QCP as work progresses.

2. Acceptance Sampling & Testing Methods:

i. General:

Acceptance samples of mixtures shall be obtained from the hauling vehicles and tested by the Contractor at the facility during each day's production.

The Contractor shall submit all acceptance tests results to the Engineer within 24 hours or prior to the next day's production. All acceptance test specimens and supporting documentation must be retained by the Contractor. Verification testing will be performed by the Engineer in accordance with the Department's QA Program for Materials. Labeled Acceptance test specimens shall be retained at the production facilities and may be disposed of with the approval of the Engineer. All Quality Control specimens shall be clearly labeled and separated from the Acceptance specimens.

Should the Department be unable to verify the Contractor's acceptance test result(s) due to a failure of the Contractor to retain acceptance test specimens or supporting documentation, the Contractor shall review its quality control plan, determine the cause of the nonconformance and respond in writing within 24 hours to the Engineer describing the corrective action taken at the plant. In addition, the Contractor must provide supporting documentation or test results to validate the subject acceptance test result(s). The Engineer may invalidate any positive adjustments for material corresponding to the acceptance test(s). Failure of the Contractor to adequately address quality control issues at a facility may result in suspension of production for Department projects at that facility.

Contractor personnel performing acceptance sampling and testing must be present at the facility prior to, during, and until completion of production, and be certified as a NETTCP HMA Plant Technician or Interim HMA Plant Technician and be in good standing. Production of material for use on State projects must be suspended by the Contractor if such personnel are not present.

Technicians found by the Engineer to be non-compliant with NETTCP or Department policies may be removed by the Engineer from participating in the acceptance testing process for Department projects until their actions can be reviewed.

Anytime during production that testing equipment becomes inoperable, production can continue for a maximum of 1 hour. The Contractor shall obtain box sample(s) in accordance with Table M.04.03-1 to satisfy the daily acceptance testing requirement for the quantity shipped to the project. The box sample(s) shall be tested once the equipment issue has been resolved to the satisfaction of the Engineer. Production beyond 1 hour may be considered by the Engineer. Production will not be permitted beyond that day until the subject equipment issue has been resolved.

ii. Curb Mix Acceptance Sampling and Testing Procedures:

Curb Mixes shall be tested by the Contractor at a frequency of one test per every 250 tons of cumulative production, regardless of the day of production.

When these mix designs are specified, the following acceptance procedures and AASHTO test methods shall be used:

TABLE M.04.03 – 2: Curb Mix Acceptance Test Procedures

Protocol	Reference	Description
1	AASHTO T 30(M)	Mechanical Analysis of Extracted Aggregate
2	AASHTO T 168	Sampling of Bituminous Concrete
3	AASHTO T 308	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
4	AASHTO T 209(M)	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
5	AASHTO T 312	Superpave Gyratory molds compacted to N_{des}
6	AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

a. Determination of Off-Test Status:

- i. The test results of AASHTO T 308 and T 30(M) will be used to determine if the mixture is within the tolerances shown in Table M.04.02-1. Curb Mixtures are considered “off test” when the test results indicate that any single value for bitumen content or gradation are not within the tolerances shown in Table M.04.02-1 for that mixture. If the mix is “off test”, the Contractor must take immediate actions to correct the deficiency and a new acceptance sample shall be tested on the same day or the following day of production.
- ii. When multiple plants and silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the “off test” status.

- iii. The Engineer may cease supply from the plant when test results from three consecutive samples are not within the JMF tolerances or the test results from two consecutive samples not within the master range indicated in Table M.04.02-1 regardless of production date.

b. JMF Changes

- i. If a test indicates that the bitumen content or gradation are outside the tolerances, the Contractor may make a single JMF change as allowed by the Engineer prior to any additional testing. A JMF change shall include the date and name of the Engineer that allowed it. Consecutive test results outside the requirements of Table M.04.02-1 JMF tolerances may result in rejection of the mixture.
- ii. Any modification to the JMF shall not exceed 50% of the JMF tolerances indicated in Table M.04.02-1 for any given component of the mixture without approval of the Engineer. When such an adjustment is made to the bitumen, the corresponding production percentage of bitumen shall be revised accordingly.

iii. Superpave Mix Acceptance Sampling and Testing Procedures:

The hauling vehicle from which samples are obtained shall be selected using stratified – random sampling based on the total estimated tons of production in accordance with ASTM D 3665, except that the first test shall be randomly taken from the first 151 tons or as directed by the Engineer. The Engineer may request a second acceptance test within the first sub lot. One acceptance test shall always be performed in the last sub-lot based on actual tons of material produced.

The number of sub lots/acceptance tests is based on the total production per day as indicated in Table M.04.03-1. Quantities of the same type/level mix per plant may be combined daily for multiple state projects to determine the number of sub lots. The Engineer may direct that additional acceptance samples be obtained to represent materials actually being delivered to the project.

The payment adjustment for air voids and liquid binder will be calculated per sub lot as described in Section 4.06.

An acceptance test shall not be performed within 150 tons of production from a previous acceptance test unless approved by the Engineer. Quality Control tests are not subject to this restriction. Unless otherwise tested, a minimum of one (1) acceptance test shall be performed for every four days of production at a facility for each type/level mix (days of production may or may not be consecutive days).

TABLE M.04.03 – 1:
Superpave Acceptance Testing Frequency per Type/Level/Plant

Daily quantity produced in tons (lot)	Number of Sub Lots/Tests
0 to 150	0, Unless requested by the Engineer
151 to 600	1
601 to 1,200	2
1,201 to 1,800	3
1,801 or greater	1 per 600 tons or portions thereof

When the Superpave mix design is specified, the following acceptance and AASHTO test procedures shall be used:

TABLE M.04.03– 3: Superpave Acceptance Testing Procedures

Protocol	Reference	Description
1	AASHTO T 168	Sampling of bituminous concrete
2	AASHTO R 47	Reducing samples to testing size
3	AASHTO T 308	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
4	AASHTO T 30	Gradation of extracted aggregate for bituminous concrete mixture
5	AASHTO T 312	⁽¹⁾ Superpave Gyratory molds compacted to N _{des}
6	AASHTO T 166	⁽²⁾ Bulk specific gravity of bituminous concrete
7	AASHTO R 35	⁽²⁾ Air voids, VMA
8	AASHTO T 209(M)	Maximum specific gravity of bituminous concrete (average of two tests)
9	AASHTO T 329	Moisture content of Production bituminous concrete

Notes: ⁽¹⁾ One set equals two six-inch molds. Molds to be compacted to N_{max} for PPTs and to N_{des} for production testing. The first subplot of the year will be compacted to N_{max}

⁽²⁾ Average value of one set of six-inch molds.

If the average corrected Pb content differs by 0.3% or more from the average bituminous concrete facility production delivery ticket in five (5) consecutive tests regardless of the production date (moving average), the Contractor shall immediately investigate, determine an assignable cause and correct the issue. When two consecutive moving average differences are 0.3% or more, the Engineer may require a new aggregate correction factor.

The test specimen must be ready to be placed in an approved ignition furnace for testing in accordance with AASHTO T 308 within thirty minutes of being obtained from the hauling vehicle and the test shall start immediately after.

The Contractor shall perform moisture susceptibility (TSR) testing annually for all design levels of HMA-, WMA-, and PMA- S0.5 plant-produced mixtures, in accordance with the latest version of AASHTO T 283(M).

If any material source changes from the previous year, or during the production season, a mix design TSR as well as a production TSR is required for the new mixture. The AASHTO T 283(M) test shall be performed at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP Certified Technicians. The test results and specimens shall be submitted to the Engineer for review. This shall be completed within 30 days from the start of production. Superpave mixtures that require anti-strip additives (either liquid or mineral) shall continue to meet all requirements specified herein for binder and bituminous concrete. The Contractor shall submit the name, manufacturer, percent used, technical datasheet and SDS for the anti-strip additive (if applicable) to the Engineer. In addition, compaction of samples shall be accomplished utilizing an accepted Superpave Gyratory Compactor (SGC), supplied by the Contractor. The SGC shall be located at the facility supplying mixture to the project.

a. Determination of Off-Test Status:

- i. Superpave mixes shall be considered "*off test*" when any Control Point Sieve, VA, VMA, and Gmm values are outside of the limits specified in Table M.04.03-4 and the computed binder content (Pb) established by AASHTO T308 or as documented on the vehicle delivery ticket is below the minimum binder content stated in sub article M.04.02-5. Note that further testing of samples or portions of samples not initially tested for this purpose cannot be used to change the status.
- ii. Any time the bituminous concrete mixture is considered Off-test:
 1. The Contractor shall notify the Engineer (and project staff) when the plant is "*off test*" for a type of mixture. When multiple plants and silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the "*off test*" determination.
 2. The Contractor must take immediate actions to correct the deficiency, minimize "*off test*" production to the project, and obtain an additional Process Control (PC) test after any corrective action to verify production is in conformance to the specifications. A PC test will not be used for acceptance and is solely for the use of the Contractor in its quality control process.

- b. Cessation of Supply for Superpave Mixtures with no Payment Adjustment: Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the JMF and volumetric properties. The quantity of Superpave mixtures shipped to the project that is "off-test" will not be adjusted for deficient mixtures.

A Contractor shall cease to supply mixture from a plant when:

1. Bituminous concrete mixture is “off test” on three (3) consecutive tests for any combination of VMA or Gmm, regardless of date of production.
2. Bituminous concrete mixture is “off test” on two (2) consecutive tests for the Control Point sieves in one day’s production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

- c. Cessation of Supply for Superpave Mixtures with Payment Adjustment: Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the Superpave minimum binder content by mix type and level listed in Table M.04.02-5. The quantity of Superpave mixtures shipped to the project that is “off-test” will be adjusted for deficient mixtures in accordance with Section 4.06.

A Contractor shall cease to supply mixture from a plant when:

1. The binder content (Pb) is below the requirements of Table M.04.02-5 on the ignition oven test result after two (2) consecutive tests, regardless of the date of production.
2. The air voids (VA) is outside the requirements of Table M.04.03-4 after three (3) consecutive tests, regardless of the date of production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

- d. JMF Changes for Superpave Mixture Production: It is understood that a JMF change is effective from the time it was submitted forward and is not retroactive to the previous test or tests. JMF changes are permitted to allow for trends in aggregate and mix properties but every effort shall be employed by the Contractor to minimize this to ensure a uniform

and dense pavement. A revised JMF submittal shall include the date and name of the Engineer that allowed it.

JMF changes are only permitted prior to or after a production shift for all bituminous-concrete types of mixtures and only when they:

- i. Are requested in writing and pre-approved by the Engineer.
- ii. Are based on a minimum of a two test trend.
- iii. Are documented with a promptly submitted revised JMF on the form provided by the Engineer.
- iv. A revised JMF submittal shall include the date and name of the Engineer that allowed it.

No change will be made on any aggregate or RAP consensus property or specific gravity unless the test is performed at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP Certified Technicians.

A JMF change shall be submitted every time the plant target RAP and/or bin percentage deviates by more than 5% and/or the plant target binder content deviates by more than 0.15% from the active JMF.

TABLE M.04.03– 4: Superpave Master Range for Bituminous Concrete Mixture Production

Notes: (1) 300°F minimum after October 15. (2) Minimum Pb as specified in Table M.04.02-5 (3) Control point range is also defined as the master range for that mix. (4) JMF tolerances shall be defined as the limits for production compliance. VA & Pb payment is subject to adjustments, as defined in sub-article 4.06.04 - 2. (5) For WMA, lower minimum aggregate temperature will require Engineer's approval. (6) For WMA and/or polymer modified asphalt, the mix temperature shall meet manufacturer's recommendations. In addition, for WMA, the maximum mix temperature shall not exceed 325°F once the WMA technology is incorporated.									
	S0.25		S0.375		S0.5		S1		Tolerances
Sieve	CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		CONTROL POINTS ⁽⁴⁾		From JMF Targets ⁽⁴⁾
inches	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	±Tol
1.5	-	-	-	-	-	-	100	-	
1.0	-	-	-	-	-	-	90	100	
3/4	-	-	-	-	100	-	-	90	
1/2	100	-	100	-	90	100	-	-	
3/8	97	100	90	100	-	90	-	-	
#4	-	90	-	90	-	-	-	-	
#8	32	67	32	67	28	58	19	45	
#16	-	-	-	-	-	-	-	-	
#200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0	
Pb ⁽²⁾	-	-	-	-	-	-	-	-	note (2)
VMA (%)	16.0		16.0		15.0		13.0		1.0
VA (%)	4.0		4.0		4.0		4.0		1.0
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Agg. Temp ⁽⁵⁾	280 – 350F		280 – 350F		280 – 350F		280 – 350F		
Mix Temp ⁽⁶⁾	265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		
Prod. TSR	N/A		N/A		≥80%		N/A		
T-283 Stripping	N/A		N/A		Minimal as determined by the Engineer		N/A		

TABLE M.04.03– 5:
JMF Tolerances for Application
of Positive Adjustments

Notes: (1) Only for S1 mixes. (2) Only for S0.5 and S1 mixes.	
Sieve	Tolerances From JMF Targets
inches	±Tol
3/4	9 (1)
1/2	9 (1)
3/8	9 (2)
#4	8
#8	7
#16	6
#200	3
Pb	0.4

TABLE M.04.03– 6:
Superpave Master Range for Traffic Levels and Design Volumetric Properties

Traffic Level	Design ESALs	Number of Gyration by Superpave Gyrotory Compactor	
	(million)	Nini	Ndes
1*	< 0.3	6	50
2	0.3 to < 3.0	7	75
3	≥3.0	8	100

* NOTE: Level 1 for use by Towns and Municipalities ONLY.

TABLE M.04.03-7:
Modifications to Standard AASHTO and ASTM Test Specifications and Procedures

AASHTO Standard Specification	
Reference	Modification
M 140	Emulsified Asphalt grade RS-1H shall meet all the requirements of the emulsified asphalt grade RS-1 except for the penetration requirement of the residue that will change from 100 to 200 penetration units (0.1 mm) to 40 to 90 penetration units (0.1 mm).
AASHTO Standard Method of Test	
Reference	Modification
T 30	Section 7.2 thru 7.4 Samples are not routinely washed for production testing
T 168	<p>Samples are taken at one point in the pile. Samples from a hauling vehicle are taken from only one point instead of three as specified.</p> <p>Selection of Samples: Sampling is equally important as the testing, and the sampler shall use every precaution to obtain samples that are truly representative of the bituminous mixture.</p> <p>Box Samples: In order to enhance the rate of processing samples taken in the field by construction or maintenance personnel the samples will be tested in the order received and data processed to be determine conformance to material specifications and to prioritize inspections by laboratory personnel.</p>
T 195	Section 4.3 only one truck load of mixture is sampled. Samples are taken from opposite sides of the load.
T 209	<p>Section 7.2 The average of two bowls is used proportionally in order to satisfy minimum mass requirements.</p> <p>8.3 Omit Pycnometer method.</p>
T 283	When foaming technology is used, the material used for the fabrication of the specimens shall be cooled to room temperature, and then reheated to the manufactures recommended compaction temperature prior to fabrication of the specimens.
T 331	6.1 Cores are dried to a constant mass prior to testing using a core-dry machine.

AASHTO Standard Recommended Practices	
Reference	Modification
R 26	<p>Quality Control Plans must be formatted in accordance with AASHTO R 26, certifying suppliers of performance-graded asphalt binders, Section 9.0, Suppliers Quality Control Plan, and “NEAUPG Model PGAB QC Plan.”</p> <ol style="list-style-type: none"> 1. The Department requires that all laboratory technician(s) responsible for testing PG-binders be certified or Interim Qualified by the New England Transportation Technician Certification Program (NETTCP) as a PG Asphalt Binder Lab Technician. 2. Sampling of asphalt binders should be done under the supervision of qualified technician. NECTP “Manual of Practice,” Chapter 2 Page 2-4 (Key Issues 1-8). 3. A copy of the Manual of Practice for testing asphalt binders in accordance with the Superpave PG Grading system shall be in the testing laboratory. 4. All laboratories testing binders for the Department are required to be accredited by the AASHTO Materials Reference Laboratory (AMRL). 5. Sources interested in being approved to supply PG-binders to the Department by use of an “in-line blending system,” must record properties of blended material, and additives used. 6. Each source of supply of PG-binder must indicate that the binders contain no additives used to modify or enhance their performance properties. Binders that are manufactured using additives, modifiers, extenders etc., shall disclose the type of additive, percentage and any handling specifications/limitations required. 7. All AASHTO M 320 references shall be replaced with AASHTO M 332. 8. Each year, in April and September, the supplier shall submit test results for two BBR testing at two different temperatures in accordance with AASHTO R 29. <p>Suppliers shall provide AASHTO M 332 testing results and split samples at a minimum of once per lot.</p>

ON-THE-JOB TRAINING (OJT) WORKFORCE DEVELOPMENT PILOT

Description

To provide construction industry related job opportunities to minorities, women and economically disadvantaged individuals; and to increase the likelihood of a diverse and inclusive workforce on Connecticut Department of Transportation (ConnDOT) projects.

All contractors (existing and newcomers) will be automatically placed in the Workforce Development Pilot. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level for new projects. Instead, these requirements will be applicable on an annual basis for each contractor performing work on ConnDOT projects.

The OJT Workforce Development Pilot will allow a contractor to train employees on Federal, State and privately funded projects located in Connecticut. However, contractors should give priority to training employees on ConnDOT FederalAid funded projects.

Funding

The Department will establish an OJT fund annually from which contractors may bill the Department directly for eligible trainee hours. The funds for payment of trainee hours on federalaid projects will be allocated from the ½ of 1% provided for OJT funding, and will be based on hours trained, not to exceed a maximum of \$25,000.00 per year; per contractor.

Minorities and Women

Developing, training and upgrading of minorities, women and economically disadvantaged individuals toward journey person level status is the primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority, women and economically disadvantaged individuals as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Coordinator, will assign training goals for a calendar year based on the contractor's past two year's activities and the contractor's anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time, the Contractor shall enter into an agreement with the Department to provide a selfimposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from one (1) to six (6) per

contractor per calendar year. Each January, a summary of the trainees required and the OJT Workforce Development Pilot package will be sent to participating contractors. The number of trainees assigned to each contractor in the summary will increase proportionately not to exceed 6, as shown in the following table. This package will also be provided to contractors as they become newly eligible for the OJT Workforce Development Pilot throughout the remainder of the year. Projects awarded after September 30 will be included in the following year's Program.

The dollar thresholds for training assignments are as follows:

\$4.5 – 8 million=	1 trainee
\$ 9 – 15 million=	2 trainees
\$16 – 23 million=	3 trainees
\$24 – 30 million=	4 trainees
\$31 – 40 million=	5 trainees
\$41 – and above=	6 trainees

Training Classifications

Preference shall be given to providing training in the following skilled work classifications. However, the classifications established are not all-inclusive:

Equipment Operators	Electricians
Laborers	Painters
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has on file common training classifications and their respective training requirements; that may be used by the contractors. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and the number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

Where feasible, 25% percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment in the program and submit all required reports documenting company compliance under these contract requirements. These documents and any other information shall be submitted to the OJT Program Coordinator as requested.

Upon the trainee's completion and graduation from the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

In order to determine the continued effectiveness of the OJT Program in Connecticut, the department will periodically conduct personal interviews with current trainees and may survey recent graduates of the program. This enables the OJT Program Coordinator to modify and improve the program as necessary. Trainee interviews are generally conducted at the job site to ensure that the trainees' work and training is consistent with the approved training program.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no case, will the trainee be paid less than the prevailing rate for general laborer as shown in the contract wage decision (must be approved by the Department of Labor).

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee currently enrolled or who becomes enrolled in the approved training program and providing they receive the required training under the specific training program. Trainees will be allowed to be transferred between projects if required by the Contractor's schedule and workload. The OJT Program Coordinator must be notified of transfers within five (5) days of the transfer or reassignments by email (Phylisha.Coles@ct.gov).

Where a contractor does not or cannot achieve its annual training goal with female or minority trainees, they must produce adequate Good Faith Efforts documentation. Good Faith Efforts are those designed to achieve equal opportunity through positive, aggressive, and continuous result-oriented measures. 23 CFR § 230.409(g) (4). Contractors should request minorities and females from unions when minorities and females are underrepresented in the contractor's workforce.

Whenever a contractor requests ConnDOT approval of someone other than a minority or female, the contractor must submit documented evidence of its Good Faith Efforts to fill that position with a minority or female. When a non-minority male is accepted, a contractor must continue to attempt to meet its remaining annual training goals with females and minorities.

Where a contractor has neither attained its goal nor submitted adequate Good Faith Efforts documentation, ConnDOT will issue a letter of non-compliance. Within thirty (30) days of receiving the letter of non-compliance, the contractor must submit a written Corrective Action Plan (CAP) outlining the steps that it will take to remedy the non-compliance. The CAP must be approved by ConnDOT. Failure to comply with the CAP may result in your firm being found non-responsive for future projects.

Measurement and Payment

Optional reimbursement will be made to the contractor for providing the required training under this special provision on ConnDOT Federal6Aid funded projects only.

Contractor will be reimbursed at \$0.80 for each hour of training given to an employee in accordance with an approved training or apprenticeship program. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

Reimbursement for training is made annually or upon the trainees completion and not on a monthly basis. No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor.

Program reimbursements will be made directly to the prime contractor on an annual basis. To request reimbursement, prime contractors must complete the Voucher for OJT Workforce Development Pilot Hourly Reimbursement for each trainee in the OJT Program. This form is included in the OJT Workforce Development Pilot package and is available on the Department's web site at:

www.ct.gov/dot

The completed form must be submitted to the Office of Contract Compliance for approval. The form is due on the 15th day of January for each trainee currently enrolled and for hours worked on ConnDOT Federal6Aid funded projects only.

SMALL CONTRACTOR AND SMALL CONTRACTOR MINORITY BUSINESS ENTERPRISES (SET-ASIDE)

March, 2001

NOTE: Certain of the requirements and procedures stated in this "Special Provision" are applicable prior to the execution of the Contract.

I. GENERAL

- A. The Contractor shall cooperate with the Connecticut Department of Transportation (CONNDOT) in implementing the required contract obligations concerning "Small Contractor" and "Small Contractor Minority Business Enterprise" use on this Contract in accordance with Section 4a-60g of the Connecticut General Statutes as revised. References, throughout this "Special Provision", to "Small Contractors" are also implied references to "Small Contractor Minority Business Enterprises" as both relate to Section IIA of these provisions. The Contractor shall also cooperate with CONNDOT in reviewing the Contractor's activities relating to this provision. This "Special Provision" is in addition to all other equal opportunity employment requirements of this Contract.
- B. For the purpose of this "Special Provision", the "Small Contractor(s)" and "Minority Business Enterprise(s)" named to satisfy the set-aside requirement must be certified by the Department of Administrative Services, Business Connections/ Set-Aside Unit [(860) 713-5236 www.das.state.ct.us/busopp.htm] as a "Small Contractor" and "Minority Business Enterprises" as defined by Section 4a-60g Subsections (1) and (3) of the Connecticut General Statutes as revised and is subject to approval by CONNDOT to do the work for which it is nominated pursuant to the criteria stipulated in Section IIC-3.
- C. Contractors who allow work which they have designated for "Small Contractor" participation in the pre-award submission required under Section IIC to be performed by other than the approved "Small Contractor" organization and prior to concurrence by CONNDOT, will not be paid for the value of the work performed by organizations other than the "Small Contractor" designated.
- D. If the Contractor is unable to achieve the specified contract goals for "Small Contractor" participation, the Contractor shall submit written documentation to CONNDOT's Manager of Construction Operations indicating his/her good faith efforts to satisfy goal requirements. Documentation is to include but not be limited to the following:

1. A detailed statement of the efforts made to select additional subcontract opportunities for work to be performed by each "Small Contractor" in order to increase the likelihood of achieving the stated goal.
 2. A detailed statement, including documentation of the efforts made to contact and solicit contracts with each "Small Contractor", including the names, addresses, dates and telephone numbers of each "Small Contractor" contacted, and a description of the information provided to each "Small Contractor" regarding the scope of services and anticipated time schedule of items proposed to be subcontracted and the nature of response from firms contacted.
 3. For each "Small Contractor" that placed a subcontract quotation which the Contractor considered not to be acceptable, provide a detailed statement of the reasons for this conclusion.
 4. Documents to support contacts made with CONNDOT requesting assistance in satisfying the contract specified or adjusted "Small Contractor" dollar requirements.
 5. Document other special efforts undertaken by the Contractor to meet the defined goal.
- E. Failure of the Contractor to have at least the specified dollar amount of this contract performed by "Small Contractor" as required in Section IIA of this "Special Provision" will result in the reduction in contract payment to the Contractor by an amount equivalent to that determined by subtracting from the specific dollar amount required in Section IIA, the dollar payments for the work actually performed by each "Small Contractor". The deficiency in "Small Contractor" achievement, will therefore, be deducted from the final contract payment. However, in instances where the Contractor can adequately document or substantiate its good faith efforts made to meet the specified or adjusted dollar amount to the satisfaction of CONNDOT, no reduction in payments will be imposed.
- F. All records must be retained for a period of three (3) years following completion of the contract and shall be available at reasonable times and places for inspection by authorized representatives of CONNDOT.
- G. Nothing contained herein, is intended to relieve any contractor or subcontractor or material supplier or manufacturer from compliance with all applicable Federal and State legislation or provisions concerning equal employment opportunity, affirmative action, nondiscrimination and related subjects during the term of this Contract.

II. SPECIFIC REQUIREMENTS

In order to increase the participation of "Small Contractors", CONNDOT requires the following:

- A. Not less than 16.0 (%) percent of the **final** value of this Contract shall be subcontracted to and performed by, and/or supplied by, manufactured by and paid to "Small Contractors" and/or "Small Contractors Minority Business Enterprises".

If the above percentage is zero (0%) AND an asterisk () has been entered in the adjacent brackets [], this Contract is 100% solely set-aside for participation by "Small Contractors" and/or "Small Contractors Minority Business Enterprises".*

- B. The Contractor shall assure that each "Small Contractor" will have an equitable opportunity to compete under this "Special Provision", particularly by arranging solicitations, time for the preparation of Quotes, Scope of Work, and Delivery Schedules so as to facilitate the participation of each "Small Contractor".
- C. The Contractor shall provide to CONNDOT's Manager of Contracts within Seven (7) days after the bid opening the following items:
1. An affidavit (Exhibit I) completed by each named "Small Contractor" subcontractor listing a description of the work and indicating the dollar amount of all contract(s) and/or subcontract(s) that have been awarded to him/her for the current State Fiscal Year (July 1 - June 30) does not exceed the Fiscal Year limit of \$10,000,000.00.
 2. A certification of work to be subcontracted (Exhibit II) signed by both the Contractor and the "Small Contractor" listing the work items and the dollar value of the items that the nominated "Small Contractor" is to perform on the project to achieve the minimum percentage indicated in Section IIA above.
 3. A certification of past experience (Exhibit III) indicating the scope of work the nominated "Small Contractor" has performed on all projects, public and private, for the past two (2) years.
 4. In instances where a change from the originally approved named "Small Contractor" (see Section IB) is proposed, the Contractor is required to submit, in a reasonable and expeditious manner, a revised submission, comprised of the documentation required in Section IIC, Paragraphs 1, 2 and 3 and Section E together with documentation to substantiate and

justify the change, (i.e., documentation to provide a basis for the change) to CONNDOT's Manager of Construction Operations for its review and approval prior to the implementation of the change. The Contractor must demonstrate that the originally named "Small Contractor" is unable to perform in conformity to specifications, or unwilling to perform, or is in default of its contract, or is overextended on other jobs. The Contractor's ability to negotiate a more advantageous contract with another "Small Contractor" is not a valid basis for change. Documentation shall include a letter of release from the originally named "Small Contractor" indicating the reason(s) for the release.

- D. After the Contractor signs the Contract, the Contractor will be required to meet with CONNDOT's Manager of Construction Operations or his/her designee to review the following:
1. What is expected with respect to the "Small Contractor" set aside requirements.
 2. Failure to comply with and meet the requirement can and will result in monetary deductions from payment.
 3. Each quarter after the start of the "Small Contractor" the Contractor shall submit a report to CONNDOT's Manager of Construction Operations indicating the work done by, and the dollars paid to each "Small Contractor" to date.
 4. What is required when a request to sublet to a "Small Contractor" is submitted.
- E. The Contractor shall submit to CONNDOT's Manager of Construction Operations all requests for subcontractor approvals on standard forms provided by the Department.

If the request for approval is for a "Small Contractor" subcontractor for the purpose of meeting the contract required "Small Contractor" percentage stipulated in Section IIA, a copy of the legal contract between the Contractor and the "Small Contractor" subcontractor must also be submitted at the same time. Any subsequent amendments or modifications of the contract between the Contractor and the "Small Contractor" subcontractor must also be submitted to CONNDOT's Manager of Construction Operations with an explanation of the change(s). The contract must show items of work to be performed, unit prices and, if a partial item, the work involved by both parties.

In addition, the following documents are to be attached:

- (1) A statement explaining any method or arrangement for renting equipment. If rental is from a Contractor, a copy of Rental Agreement must be submitted.
 - (2) A statement addressing any special arrangements for manpower.
 - (3) A statement addressing who will purchase material.
- F. Contractors subcontracting with a "Small Contractor" to perform work or services as required by this "Special Provision" shall not terminate such firms without advising CONNDOT, in writing, and providing adequate documentation to substantiate the reasons for termination if the designated "Small Contractor" firm has not started or completed the work or the services for which it has been contracted to perform.

G. Material Suppliers or Manufacturers

If the Contractor elects to utilize a "Small Contractor" supplier or manufacturer to satisfy a portion or all of the specified dollar requirements, the Contractor must provide the Department with:

1. An executed Affidavit Small Contractor (Set-Aside) Connecticut Department of Transportation Affidavit Supplier or Manufacturer (sample attached), and
2. Substantiation of payments made to the supplier or manufacturer for materials used on the project.

Brokers and packagers shall not be regarded as material Suppliers or manufacturer.

H. Non-Manufacturing or Non-Supplier "Small Contractor" Credit

Contractors may count towards its "Small Contractor" goals the following expenditures with "Small Contractor" firms that are not manufacturers or suppliers:

1. Reasonable fees or commissions charged for providing a bona fide service such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, material or supplies necessary for the performance of the contract provided that the fee or commission is determined by the Department of Transportation to be reasonable and consistent with fees customarily allowed for similar services.

2. The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by the Department of Transportation to be reasonable and not excessive as compared with fees customarily allowed for similar services.
3. The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the Contract, provided that the fee or commission is determined by the Department of Transportation to be reasonable and not excessive as compared with fees customarily allowed for similar services.

III. **BROKERING**

For the purpose of this "Special Provision", a "Broker" is one who acts as an agent for others in negotiating contracts, purchases, sales, etc., in return for a fee or commission. Brokering of work by a "Small Contractor" is not allowed and is a contract violation.

IV. **PRE-AWARD WAIVERS:**

If the Contractor's submission of the "Small Contractor" listing, as required by Section IIC indicates that it is unable, by subcontracting to obtain commitments which at least equal the amount required by Section IIA, it may request, in writing, a waiver of up to 50% of the amount required by Section IIA. To obtain such a waiver, the Contractor must submit a completed "Application for Waiver of Small Contractor Minority Business Enterprise Goals" to CONNDOT's Manager of Contracts which must also contain the following documentation:

1. Information described in Section ID.
2. For each "Small Contractor" contacted but unavailable, a statement from each "Small Contractor" confirming its unavailability.

Upon receipt of the submission requesting a waiver, the CONNDOT's Manager of Contracts shall submit the documentation to the Director of the Office of Contract Compliance who shall review it for completeness. After completion of the Director of Contract Compliance's review, she/he should write a narrative of his/her findings of the application for a waiver, which is to include his/her recommendation. The Director of Contract Compliance shall submit the written narrative to the Chairperson of the DBE Screening Committee at least five (5) working days before the scheduled meeting. The Contractor shall be invited to attend the meeting and present his/her position. The DBE Screening Committee shall render a decision on the waiver request within five (5)

working days after the meeting. The DBE Screening Committee's decision shall be final. Waiver applications are available from the CONNDOT Manager of Contracts.

Mar. 01

(* Delete if not Applicable)
SET-ASIDE PROGRAM
(QUALIFICATION AFFIDAVIT)

COUNTY OF _____

PERSON FIRM OR ORGANIZATION

<u>Col. 1</u> TOWN AND PROJECT NUMBER	<u>Col. 2</u> STATE AGENCY WHICH AWARDED CONTRACT	<u>Col. 3</u> CONTRACT AMOUNT AWARDED UNDER THIS PROGRAM	<u>Col. 4</u> AMOUNT OF WORK SUBCONTRACTED FROM OTHER FIRMS UNDER THIS PROGRAM	<u>Col. 5</u> TOTAL AMOUNT OF ALL WORK UNDER THIS PROGRAM Col. 3 Plus Col. 4
	TOTALS	\$	\$	\$

(FIRM SEAL)

SIGNATURE & TITLE OF OFFICIAL

WHO IS PERSONALLY KNOWN TO ME, THIS _____ DAY OF _____, 20_____

(NOTARY PUBLIC)

MY COMMISSION EXPIRES _____ SEAL _____

GENERAL

Mar.01

* Delete if not applicable

GENERAL

DESCRIPTION OF PROJECT _____

DATE _____

Name, Address & Tel No. of the Nominated Firm	ITEM(s) NUMBER(s) and Description of the Item(s) to be performed by and paid to the Subcontractor	Quantities (indicate if partial)	Prime's Bid Amount For Item	Dollar Amount Subcontracted	Small Business Set-Aside Dollar Requirement

76-193

EXHIBIT III

CERTIFICATION
PAST CONSTRUCTION EXPERIENCE

Mar.01

GENERAL

SMALL CONTRACTOR / * MINORITY BUSINESS ENTERPRISES

* Delete if not applicable

PLEASE LIST ALL CONSTRUCTION PROJECTS YOUR ORGANIZATION HAS WORKED ON IN THE PAST TWO FISCAL YEARS

PROJECT LOCATION NUMBER AND DESCRIPTION APPLICABLE	CONTRACT AMOUNT	IF WORK PERFORMED AS PRIME GIVE OWNERS NAME IF WORK PERFORMED AS SUBCONTRACTOR GIVE CONTRACTORS NAME	START DATE	ACTUAL OR ESTIMATED COMPLETION DATE	NAME AND PHONE OF OWNER OR PRIME CONTRACTOR AS

SIGNED BY:

SMALL BUSINESS CONTRACTOR
*MINORITY BUSINESS ENTERPRISES

D.O.T. PROJECT NO.

* Delete if not applicable

MARCH, 2001

**SMALL CONTRACTOR/SMALL CONTRACTOR MINORITY BUSINESS ENTERPRISE
(MBE) (SET-ASIDE) CONNECTICUT DEPARTMENT OF TRANSPORTATION
AFFIDAVIT – SUPPLIER OR MANUFACTURER**

This affidavit must be completed by the State Contractor's designated Small Contractor/ Small Contractor Minority Business Enterprise (MBE), notarized and attached to the contractor's request to utilize a Small Contractor/Small Contractor Minority Business Enterprise (MBE) supplier or manufacturer as a credit towards its Small Contractor/Small Contractor Minority Business Enterprise (MBE) contract requirement; failure to do so will result in not receiving credit towards the contract Small Contractor/Small Contractor Minority Business Enterprise (MBE) requirement.

State Project No. _____

Federal Aid Project No. _____

Description of Project _____

I, _____, acting in behalf of _____
(Name of person signing Affidavit) (Small Contractor/Small Contractor MBE contractor person,

_____ of which I am the _____ affirm that _____
firm, association or certify and corporation) (Title of Person) (Small

Contractor/Small Contractor MBE person, firm, association or corporation) _____ is a certified Small Contractor/Small

Contractor Minority Business Enterprise, as defined by Section 4a-60g of the Connecticut General Statutes, as revised.

I further certify and affirm that _____
(Small Contractor/Small Contractor MBE person, firm, association or corporation)

will assume the actual and contractual responsibility for the provision of the materials and/or supplies sought by _____. If a manufacturer, I produce goods from raw

materials or substantially alter them before resale, or if a supplier, I perform a commercially useful function in the supply process.
(State Contractor)

I understand that false statements made herein are punishable at Law (Sec. 53a-157, CGS, as revised).

(Name of Small Contractor/Small Contractor MBE person, firm, association or corporation)

(Signature and Title of Official making the Affidavit)

Subscribed and sworn to before me, the _____ day of _____ 200_____.

Notary Public (Commissioner of the Superior Court)

My Commission Expires _____

CERTIFICATE OF CORPORATION

I, _____, certify that I am the _____
(Official) of the Corporation named in the foregoing instrument; that I have been duly authorized to affix
the seal of the Corporation to such papers as require the seal; that _____, who
signed said instrument on behalf of the Corporation, was then _____ of
said corporation; that said instrument was duly signed for and in behalf of said Corporation by authority
of its governing body and is within the scope of its corporation powers.

(Signature of Person Certifying)

(Date)

(Corporate Seal)

ITEM #0204151A – HANDLING WATER

Description: Work under this item shall consist of the construction of such cofferdams, flow diversions, barriers, diversion pipes, or other such protective facilities and methods necessary for the conduction of water beyond the limits of construction; the dewatering of the site on which the permanent structure is to be constructed; and the removal of all such temporary structures and facilities upon the completion of the permanent work or as required.

For the purposes of this specification, such work shall be understood to mean any temporary type of protective facility which complies with the water handling plan indicated in the contract and which satisfies the condition that the permanent structure be built in the dry.

This work includes completely blocking the flow of the unnamed tributary of the West branch of the West River.

Materials: Sandbags or concrete blocks may be used to control the flow of water. Sandbags shall be of sound quality and, if punctured, shall be replaced at no additional charge. These bags and blocks shall be of sufficient size to withstand the anticipated water pressure and form a stable cofferdam.

The pump shall be sized to handle the flow of the unnamed brook for the required time period. See the Hydraulic Data Table on the bridge Construction and Grading Plan for information about flow rates. The pipes used to conduct the flow from the pumps shall also be sized to accommodate the flow from the pump.

The temporary pipe shall have an inside diameter of 18". The interior shall be smooth, with a Mannings 'N' value less than or equal to 0.024. The material shall be selected such that it is appropriate to the installation and can be easily constructed to the horizontal and vertical alignment shown on the plans.

Blocking, support and hold-down devices for the temporary pipe shall be of a quality that will function safely throughout the duration of construction. The contractor shall design the supports for the pipe assuming the weight of pipe flowing full.

Construction Methods: The Contractor shall investigate and verify existing stream conditions and design the necessary protection and facilities to conform to the water handling plan shown in the contract. Before commencing construction the Contractor shall furnish the Engineer with details of the plan and methods he proposes to use for handling water and accomplishing the work. The furnishing of such plans and methods shall not relieve the Contractor of any of his responsibility for the safety of the work and for the successful completion of the project.

The height of any cofferdams, flow diversions, or barriers shall be as called for in the contract. Any necessary diversion pipes shall be installed in accordance with the contract. All such temporary structures or facilities shall be safely designed for all applicable loadings, extended to

sufficient depth and be of such dimensions and water-tightness so as to assure construction of the permanent work in the dry. They shall not interfere with proper performance of the work. Their locations shall be such as to permit excavation for permanent work to the limits shown on the plans. Interior dimensions shall give sufficient clearance for construction and inspection of forms. Movements or failures of the temporary protection facilities, or any portions thereof, which prevent proper completion of the permanent work shall be corrected at the sole expense of the Contractor.

Any pumping from within the areas of construction shall be done in such a manner as to prevent the possibility of movement of water through any fresh concrete. No pumping will be permitted during placing of concrete or for a period of 24 hours thereafter, unless it is done from a suitable sump pump properly located and with a capacity to protect against damage from sudden rising of water. Any pumped water must be discharged in accordance with the requirements of Section 1.10.

Unless otherwise provided, or directed, all such temporary protective work shall be removed and disposed of in an approved manner when no longer required.

The Contractor shall be responsible for the scheduling of work under this item so as not to interfere with any sequence of operations developed for this project. Delays as a result of work required under this item shall not constitute a claim for an extension of contract time.

Method of Measurement: This item, being paid for on a lump sum basis, will not be measured for payment.

Basis of Payment: Payment for this item will be made at the lump sum price for "Handling Water", complete and accepted, which price shall include all tools, materials, equipment, labor and work incidental to the construction; reconstruction, if required; dewatering, including pumping and any related environmental controls used in handling water; handling of the stream flow during construction; the removal and disposal of all protective works or facilities; disposal of water removed from the construction; damages incurred by the Contractor; and any damage to existing facilities and to the work in progress, materials or equipment from flows or high stages of the stream. No additional payment will be made to move materials and equipment during high flows and no claims for delay may result due to conditions that mandate evacuation of the site.

ITEM #0210100A – ANTI-TRACKING PAD

2.10.01 - Description: Work under this item shall consist of the installation, maintenance, and removal of anti-tracking pad(s), in accordance with the contract plan details at the plan locations or as ordered by the Engineer. Where anti-tracking pads are to be installed adjacent to paved surfaces with curbing, the work shall include the removal of the curbing and the replacement of the curbing when the pad is removed.

2.10.02 - Materials: The crushed stone for this work shall conform to the requirements of Article M.01.01 for No. 3 coarse aggregate. Geotextile shall conform to the requirements of Article M.08.01-19. Materials incidental to and necessary for the installation of the geotextile, such as, but not limited to sewing thread, staples, pins, etc., shall conform to the requirements of the manufacturer of the geotextile.

Materials for the curbing, shall conform to the requirements of Division III, Materials, Section, of the Standard Specifications, for the appropriate curbing type.

2.10.03 - Construction Methods: The area(s) on which the anti-tracking pad(s) are to be placed shall be shaped to a reasonably true surface prior to the installation of the geotextile. The geotextile shall be installed at the location(s) and to the dimensions as shown on the plans or as directed by the Engineer. Geotextile shall be installed as recommended by the manufacturer for the specific use. Crushed stone shall be placed over the geotextile to the depth shown on the plans and shall be finished to a smooth uniform surface matching into the surrounding grade.

The Contractor shall add crushed stone and regrade the pad during the construction phase as required to maintain the depth of stone as noted on the plans. Upon completion of work at a site, the anti-tracking pad(s) shall be removed in its entirety and the site restored to its original condition.

Excavated material from the installation of the anti-tracking pad(s) shall be stockpiled by the Contractor and shall be used for the restoration of the site when the pad is removed with the following exception. .

At locations where the anti-tracking pad is adjacent to a paved surface with curbing, the Contractor shall remove the curbing from the pavement in a manner to minimize any damage to the pavement. The anti-tracking pad shall be installed to match the pavement grade.

Upon removal of the pad(s), the Contractor shall construct replacement curbing matching the material, dimensions and details of the existing curbing at the site. Construction of the curbing shall be in general accordance with the Standard Specifications for the appropriate curbing material type (concrete, stone, or bituminous).

2.10.04 - Method of Measurement: This work shall be measured by the actual number of square yards of completed and accepted anti-tracking pad(s).

2.10.05 - Basis of Payment: This work will be paid for at the contract unit price per square yard for “Anti-Tracking Pad” which price shall include all excavation, backfill, stockpiling of material, removal of curbing, disposal of surplus material, crushed stone, geotextile, backfill, tack coat, curbing and all equipment, tools, labor and materials incidental to the installation, maintaining and removal of the anti-tracking pad(s) and adjacent curbing including restoring the site to its original condition.

Pay Item**Pay Unit**

Anti-Tracking Pad

S.Y.

ITEM #0216012A – CONTROLLED LOW STRENGTH MATERIAL

Description: Controlled Low Strength Material (CLSM) is a self consolidating, rigid setting material to be used in backfills, fills, structural fills and elsewhere as indicated on the plans, or as directed by the Engineer. The flow and set time characteristics of CLSM shall be designed to meet the specific job conditions. All CLSM material covered by this specification shall be designed to be hand excavatable at any time after placement. It shall be composed of a mixture of portland cement, aggregate, and water with the option of using fly ash, slag cement, air-entraining agents, and other approved admixtures.

Materials: All materials utilized in the CLSM mix design shall be in accordance with the applicable requirements of Section M.03.

Composition: The composition of the CLSM shall be in accordance with the requirements set forth in Article M.03.02-Mix Design Requirements, as well as the applicable sections of ACI 229R. The Contractor shall submit each proposed mix design, with all supporting data, to the Engineer for review and approval at least two weeks prior to its use.

The setting time of CLSM materials shall be designed so as to achieve the strength necessary to comply with the time constraints called for under the Maintenance and Protection of Traffic requirements of the project specifications. The use of chloride accelerators is not permitted.

The minimum compressive strength of the CLSM material shall be 30 pounds per square inch (psi) and the maximum compressive strength of the CLSM shall be 150 pounds per square inch (psi) when tested in accordance with ASTM D4832 after 56 days.

The CLSM mix design shall utilize a nominal maximum size of No. 8 aggregate as specified in M.01.01.

CLSM mixes shall have a minimum of 20% entrained air when tested in accordance with AASHTO T152.

Construction Methods: CLSM shall only be placed when the ambient temperature is at least 32° F and rising. CLSM material shall be deposited within 2 hours of initial mixing.

CLSM may be placed by chutes, conveyors, buckets or pumps depending upon the application and accessibility of the site. Should voids or cavities remain after the placement of the CLSM, the Contractor shall modify the placement method or flow characteristics of the CLSM. Voids or cavities which have not been filled properly shall be corrected as directed by the Engineer and at the Contractor's expense.

Method of Measurement: This work will be measured for payment by the actual number of cubic yards of "Controlled Low Strength Material installed and accepted within the pay limits shown on the contract plans or as directed by the Engineer.

Basis of Payment: This work will be paid at the contract unit price per cubic yard “Controlled Low Strength Material,” which price shall include all materials, equipment, tools and labor incidental thereto.

Pay Item
Controlled Low Strength Material

Pay Unit
C. Y.

ITEM #0219050A – CATCH BASIN SEDIMENT FILTER

Description: This work shall consist of furnishing, installing, periodic inspection, maintenance, cleaning, removing and reinstalling a catch basin sediment filter as directed by the Engineer, manufacturer, and/or as shown on the plans. The purpose is to keep silt, sediment, and construction debris out of the storm water drainage system, while allowing storm water to flow continuously through the filter and into the drainage system in conformance to Section 1.10.03, Best Management Practices.

Materials: The Contractor is responsible for supplying all necessary material including; grate hooks, rebar, chains, and restraint cords to properly lift and lower a filter into and out of the inlet or the catch basin, including all materials, equipment, and labor incidental thereto. The catch basin sediment filters shall be commercially manufactured and distributed for the purpose of catching silt and sediment inside of a catch basin or inlet and separating silt, sediment, and debris from storm water. A fabric type filter shall be manufactured from a woven geotextile fabric and sewn using a high strength nylon thread. Each filter shall be manufactured to precisely fit the opening of an existing or new catch basin, drop inlet, and curb open inlet. The geotextile type filter shall have the following features: lifting loops or straps sewn as an integral part of the system to be used to lift the filter from the basin with another loop sewn along the bottom to facilitate the emptying of the filter. This type of filter shall also have restraint cords about halfway up the filter to keep the sides away from the catch basin walls. Metal basket type inserts shall have a geotextile type filter bag and the entire unit shall be able to fit inside new or existing catch basins, and shall be easily removable for ease of maintenance and cleaning.

Construction Methods: The catch basin sediment filter shall be placed by the Contractor in locations that will receive high sediment load and/or as directed by the Engineer.

Each filter shall be installed to enclose all openings of the inlet including curb open inlets, to manufacturers' recommendation and/or as directed by the Engineer.

Each filter shall be inspected within 24 hours after every major rain event with a rainfall amount of 0.1 inch or greater for fullness of sediment and debris. If there are no major rain events, the filter should be checked every two weeks or per manufacturers' recommendations or as directed by the Engineer. Filter shall be emptied when greater than one-half of the capacity is reached or in anticipation of a major rain event.

When the filter needs to be emptied, care shall be taken not to damage the inlet or filter by removal and reinstallation.

Silt, sediment, and construction debris collected by the filter shall be removed from the construction site and disposed of by the contractor.

No filter shall be reused if damaged. The filter shall be permanently removed after the entire construction is completed or as directed by the Engineer.

Method of Measurement: Catch Basin Sediment Filter will be measured for payment by the number of inlet sediment filters installed, including all specified components, for each inlet structure, including respective catch basin curb open inlets. No separate measurement will be taken for maintenance, cleaning or removal of silt, sediment, and construction debris.

Basis of Payment: “Catch Basin Sediment Filter” will be paid for at the Contract Unit Price each, which shall include all materials, labor, periodic inspection, maintenance, removing and reinstalling, cleaning, and removal of debris incidental thereto. Payment shall not include reimbursement for replacement filter due to improper installation, handling, cleaning, storage, or negligence. No direct payment shall be made for disposal of any materials removed from the sediment filter.

<u>Pay Item</u>	<u>Pay Unit</u>
CATCH BASIN SEDIMENT FILTER	EA.

ITEM #0406125A – BITUMINOUS CONCRETE SURFACE PATCH

1. **Description:** This work shall consist of milling and patching an existing deteriorated bituminous concrete pavement surface. A milling machine shall be used to remove the existing pavement to a depth of 1.5 to 2.5 inches. The milled surface shall be swept and then be blown clean with compressed air. Tack coat is to be applied to the milled surface and any vertical or semi-vertical walls formed by the milling. The milled out area shall then be filled and compacted with HMA S0.375.
2. **Materials:** Materials for this work shall consist of the following:
 - 2.1 Hot-mix Asphalt (specifically HMA S0.375) conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications. An equivalent PMA may be used conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.
 - 2.2 Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.
3. **Equipment:** Equipment for this work shall include, but is not limited to, the following:
 - 3.1 Milling machine – A milling machine designed and built for milling flexible pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing HMA pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, contact ski (30 feet minimum), non-contact ski (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The rotary drum of the machine shall utilize carbide tip tools spaced not more than 5/8 inches apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

The Contractor may request to perform a test strip to demonstrate that the same surface tolerance can be attained at an increased forward speed. The test strip shall be a maximum length of 500 feet and shall have the same criteria for surface tolerance as noted in this specification. The final decision for implementing the increased forward speed will be at the discretion of the Engineer.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation. When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

In addition to meeting those requirements, the milling machine shall be capable of removing the existing pavement to a minimum width of 20 inches in any direction. This makes the minimum achievable patch size - 20 inches by 20 inches, or 0.30 square yards.

- 3.2 Sweeper – The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper where acceptable by the Engineer.
- 3.3 Air compressor – The unit shall consist of an air compressor capable of producing 100 psi, oil free, compressed air for blowing the milled pavement surface clean.
- 3.4 Hot air lance – The unit shall be designed for cleaning and drying the pavement surface. It shall consist of an air compressor capable of delivering 100 psi, oil free heated air. The compressed air emitted from the tip of the lance shall be flame free and be capable of achieving a temperature of at least 1500°F.
- 3.5 Paving and compaction equipment – All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications. Due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work or a mixture of equipment and hand work methods and tools to achieve the required results. The same consideration is to be given to compaction of the hot mix asphalt. Smaller type compaction equipment, including vibratory plate compactors, shall be allowed to achieve the required results. At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications.

4. Construction Methods:

4.1 Demarcation of Areas to be Patched:

- 4.1.1 Areas to be patched under this item shall consist of pavement surfaces in which the existing surface lift of pavement is raveling, disintegrating, or delaminated from the lift of pavement directly beneath it. Under this specification a “lift” of pavement is defined as an individual layer of bituminous concrete that was placed and compacted previously with one placement pass of a paver or other asphalt pavement placement device or method. “Surface lift” is defined as the last individual layer of bituminous concrete placed and compacted that currently serves as the driving surface of the roadway. This could include a milled surface. These definitions apply to previously placed “surface lifts” of pavement that were between 1 inch and 2.5 inches thick.

- 4.1.2 All areas in which the surface lift of pavement displays raveling, disintegration, or delamination from the underlying lift of pavement, of such a severity, that it will not likely support traffic loadings, or remain sound and in-tact, for an additional 2 years, shall be marked out by the Engineer for removal. The minimum width of any given area shall be 20 inches. All areas to be patched shall completely encompass the entire raveled, disintegrated, or delaminated area and extend at least 6 inches beyond into the surrounding pavement.

4.2 Patch Preparation and Construction:

- 4.2.1 Utilizing the specified milling machine, mill the demarcated areas to a depth that completely removes the surface lift of pavement. The minimum depth shall be 1.5 inches and the maximum depth shall not exceed 2.5 inches.
- 4.2.2 As specified in the requirements for milling, the milled surface shall be swept clean (by hand if necessary.) Once all millings are practicably removed by sweeping, the milled areas shall be allowed to dry if necessary. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. Once the milled area is deemed dry by the Engineer it shall be blown with compressed or hot lance air, as specified above, so that no debris or dust is present on or within the milled area.
- 4.2.3 Once deemed clean by the Engineer, the milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06 of the Standard Specifications.
- 4.2.4 After the tack coat has had sufficient time to cure or break, HMA S0.375 shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specification. It shall be compacted to match the elevation of the surrounding pavement surface.

5. Method of measurement: This work shall be measured by the total area, in square yards, of "Bituminous Concrete Surface Patch."

6. Basis of Payment: This work will be paid for at the contract unit price per square yard of "Bituminous Concrete Surface Patch." The price shall include milling, pavement excavation and removal, cleaning of the milled area, tack coat application to the milled surface area, and placement and compaction of HMA S0.375. All other miscellaneous tools, materials, and equipment needed to complete the work shall also be included in the cost of the work.

Pay Item

0406125A, Bituminous Concrete Surface Patch

Pay Unit

S.Y.

ITEM #0406275A – FINE MILLING OF BITUMINOUS CONCRETE (0" TO 4")

Description: This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement.

Construction Methods: The Contractor shall remove the bituminous concrete material using means acceptable to the Engineer. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within five (5) calendar days unless otherwise stated in the plans or Contract.

The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing bituminous concrete pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, contact ski (30 feet minimum), non-contact ski (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The machine shall be able to provide a 0 to 4 inch deep cut in one pass. The rotary drum of the machine shall use carbide or diamond tipped tools spaced not more than $\frac{5}{16}$ inch apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

Protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed at the Contractor's expense.

Surface Tolerance: The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor, under the direction of the Inspector, shall perform random spot-checks with a Contractor supplied ten-foot straightedge to verify surface tolerances at a minimum of five (5) locations per day. The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed $\frac{1}{4}$ inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed $\frac{1}{4}$ inch. Any unsatisfactory surfaces produced are the responsibility of the Contractor and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The depth of removal will be verified by taking measurements every 250 feet per each pass of the milling machine, or as directed by the Engineer. These depth measurements shall be used to monitor the average depth of removal.

Where a surface delamination between bituminous concrete layers or a surface delamination of bituminous concrete on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted in small increments to a maximum of $\pm \frac{1}{2}$ inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

Any unsatisfactory surfaces produced by the milling operation are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic unless the requirements below are met. This shall include roadway structures (catch basins, manholes, utility valve boxes, etc.). If any vertical face is formed in an area exposed to traffic, a temporary paved transition shall be established according to the requirements shown on the plans. If the milling machine is used to form a temporary transition, the length of the temporary transition shall conform to Special Provision Section 4.06 –Bituminous Concrete, "Transitions for Roadway Surface," the requirements shown on the plans, or as directed by the Engineer. At all

permanent limits of removal, a clean vertical face shall be established by saw cutting prior to paving.

Roadway structures shall not have a vertical face of greater than one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (1) inch above the milled surface shall receive a transition meeting the following requirements:

For roadways with a posted speed limit of 35 mph or less*:

1. Round structures with a vertical face of greater than 1 inch to 2.5 inches shall be transitioned with a hard rubber tapered protection ring of the appropriate inside diameter designed specifically to protect roadway structures.
2. Round structures with a vertical face greater than 2.5 inches shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.
3. All rectangular structures with a vertical face greater than 1 inch shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.

*Bituminous concrete tapers at a minimum 24 to 1 (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of 40, 45 or 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

For roadways with a posted speed limit of greater than 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 60 to 1 (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

The milling operation shall proceed in accordance with the requirements of the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications, or other Contract requirements. The more stringent specification shall apply.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a forward speed that allows for the maximum pickup of millings from the roadway surface. Other

sweeping equipment may be provided in lieu of the sweeper truck where acceptable by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of 48 hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck shall have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments shall be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

Method of Measurement: This work will be measured for payment by the number of square yards of area from which the milling of asphalt has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

Basis of Payment: This work will be paid for at the Contract unit price per square yard for “Fine Milling of Bituminous Concrete (0” to 4”).” This price shall include all equipment, tools, labor, and materials incidental thereto.

No additional payments will be made for multiple passes with the milling machine to remove the bituminous surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractors negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled or paved transition; removal and disposal of millings; furnishing a sweeper truck and sweeping after milling. The costs for these items shall be included in the Contract unit price.

Pay Item	Pay Unit
Fine Milling of Bituminous Concrete (0” to 4”)	S.Y.

ITEM #0406314A – 80 MIL PAVEMENT MARKING GROOVE 5” WIDE**ITEM #0406316A – 80 MIL PAVEMENT MARKING GROOVE 9” WIDE****Description:**

Work under this item shall consist of grooving the pavement surface in a continuous or regularly spaced fashion for the placement of recessed pavement markings. Unless otherwise noted, the groove shall be 1 inch (25 mm) wider than the anticipated pavement marking. The groove for double-yellow centerline markings shall be 13 inches (330 mm) wide.

Groove Width: 5 inches (130 mm) wide for 4-inch (100 mm) markings
 7 inches (180 mm) wide for 6-inch (150 mm) markings
 9 inches (230 mm) wide for 8-inch (220 mm) markings
 13 inches (330 mm) wide for 12-inch (300 mm) markings and double yellow centerline

Groove Depth: 0.080 inches (2 mm) \pm 0.010 inches (0.25 mm)

The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The groove shall not be installed on bare concrete bridge decks, on metal bridge decks, on bridge joints, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Equipment:

The grooving equipment shall be equipped with a free-floating, depth-controlled head which provides a consistent groove depth over irregular pavement surfaces. The grooving head shall only be equipped with diamond saw blades. Any ridges in the bottom of the groove shall have a maximum height of 0.015 inches (0.38 mm).

The grooving equipment shall be capable of installing a groove 6 inches (150 mm) away from any vertical or horizontal obstruction.

Construction Methods:

The pavement marking groove shall be installed in accordance with the current ConnDOT pavement marking standard drawings.

The Contractor shall establish control points for measuring offsets and pre-marks along the entire distance of pavement being grooved. Prior to installation of the groove, the Contractor shall verify the equipment is capable of installing the correct width and spacing of the groove. The

control points, pre-marks, and equipment will be reviewed by the Engineer prior to commencement of the work.

The groove will be considered defective if any edge of the groove varies more than 0.25 inch (6.35 mm) in a 10-foot length (3 m), or if the alignment of the groove visibly deviates from the normal alignment of the road.

Final Cleaning: The Contractor shall immediately collect all debris and dust resulting from the grooving operation by vacuuming the pavement groove and adjacent pavement surface. Collected debris and any waste material shall be properly disposed of by the Contractor.

The work area shall be returned to a debris-free state prior to re-opening to traffic.

Repair of Unacceptable Groove:

The Contractor shall repair any defective groove(s) to the satisfaction of the Engineer. All work in conjunction with this repair shall be performed at no additional cost to the State.

Pavement Marking Requirements:

The Contractor is required to install permanent epoxy resin pavement markings in the grooves before the lane or roadway is opened to live traffic. If the permanent pavement markings cannot be installed before the lane or roadway is opened to live traffic, temporary 0.005-inch (0.125 mm) hot-applied waterborne pavement markings without glass beads shall be installed before the lane or roadway is opened to live traffic at no additional cost to the State. Within 10 calendar days, permanent epoxy resin pavement markings shall be applied in the groove over the 0.005-inch (0.125 mm) hot-applied waterborne pavement markings.

Groove Depth Gauge:

The Contractor shall supply the Engineer with two accurate, easily readable gauges with which to verify groove depth for the duration of the project. The gauges shall be delivered no less than one week prior to the anticipated beginning of grooving operations. Gauges shall be accompanied by manufacturer's instructions for their use. The gauges will be returned to the Contractor at the conclusion of the project.

Method of Measurement:

This work will be measured for payment by the number of linear feet (meters) of groove installed in the pavement as ordered and accepted by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per linear feet (meters) of "Pavement Marking Groove" installed in the pavement and accepted. This price shall include cleaning of the pavement, all materials, equipment, tools, depth gauges, and labor incidental thereto, and disposal of any waste material resulting from the operation.

Pay Item

80 Mil Pavement Marking Groove 5" Wide
80 Mil Pavement Marking Groove 9" Wide

Pay Unit

L.F.
L.F.

ITEM #0406999A – ASPHALT ADJUSTMENT COST

The Asphalt Price is available on the Department of Transportation web site at:

<http://www.ct.gov/dot/asphaltadjustment>

The asphalt adjustment cost will be based on the variance in price for the performance-graded binder component of hot mix asphalt (HMA), Polymer Modified Asphalt (PMA), and Ultra-Thin Bonded Hot-Mix Asphalt mixtures completed and accepted in the contract.

An asphalt adjustment cost will be applied only if all of the following conditions are met:

- I. For HMA and PMA mixtures:
 - a. The HMA or PMA mixture in which the adjustment is being applied is listed as a contract item with a pay unit of tons or metric tons.
 - b. The total quantity for all HMA and PMA mixtures in a contract or individual purchase order (Department of Administrative Service contract awards) exceeds 1000 tons or more.
 - c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00.
- II. For Ultra-Thin Bonded HMA mixtures:
 - a. The Ultra-Thin Bonded HMA mixture in which the adjustment is being applied is listed as a contract item.
 - b. The total quantity for Ultra-Thin Bonded HMA mixture in a contract exceeds:
 - i. 800 tons (727 metric tons) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of tons or metric tons.
 - ii. 30,000 square yards (25,080 square meters) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of square yards or square meters.

Note: The quantity of Ultra-Thin Bonded HMA measured in tons shall be determined from the material documentation requirements set forth in the Ultra-Thin Bonded HMA Special Provision.
 - c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than \$5.00.
 - d. No Asphalt Adjustment Cost shall be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.

- III. Regardless of the binder used in all HMA and/or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The Connecticut Department of Transportation (ConnDOT) shall post on its website, the average per ton selling price (asphalt price) of the performance-graded binder. The average is based on the high and low selling price published in the most recent available issue of the **Asphalt Weekly Monitor®** furnished by Poten & Partners, Inc. under the “East Coast Market – New England, New Haven, Connecticut area”, F.O.B. manufacturer’s terminal.

The selling price furnished from the Asphalt Weekly Monitor ® is based on a standard ton (US\$/ST). The metric ton price is determined by applying a factor of 1.1023 (US\$/ST x 1.1023 = US\$/mton). Example: \$150.00/ton x 1.1023 = \$165.34/mton

Formula:
$$\text{HMA} \times \frac{\text{PG}\%}{100} \times [(\text{Period Price} - \text{Base Price})] = \$ \text{ ______ }, \text{ where}$$

- **HMA:**
 1. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of mass:
The quantity (tons or metric tons) of accepted HMA, PMA, or Ultra-Thin Bonded HMA mixture measured and accepted for payment.
 2. For Ultra-Thin Bonded HMA mixtures with pay units of area:
The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted for payment, calculated in tons or metric tons as documented according to the Material Documentation provision (section E) of the Ultra-Thin Bonded HMA Special Provision.
- **Asphalt Base Price:** The asphalt price that is posted on the ConnDOT website 28 days before the actual bid opening posted.
- **Asphalt Period Price:** The asphalt price that is posted on the ConnDOT website for the period in which the HMA, PMA mixture is placed.
- Performance-Graded Binder percentage (**PG%**)
 1. For HMA or PMA mixes:
PG% = 4.5
 - For Superpave 1.5 inch (37.5mm), Superpave 1.0 inch (25.0mm), PMA S1, HMA S1, and Class 4
 - PG % = 5.0
 - For Superpave 0.50 inch (12.5mm), HMA S0.5, PMA S0.5, and Class 1

- PG % = 6.0
- For Superpave 0.375 inch (9.5mm), HMA S0.375, PMA S0.375, Superpave 0.25 inch (6.25mm), HMA S0.25, PMA S0.25, Superpave #4 (4.75mm) and Class 2
2. For Ultra-Thin Bonded HMA mixes:
PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to one decimal point (e.g. 5.1%)

The adjustment shall not be considered as a changed condition in the contract because of this provision and because the Contractors are being notified before submission of bids.

Basis of Payment: The "Asphalt Adjustment Cost" will be calculated using the formula indicated above. A payment will be made for an increase in costs. A deduction from monies due the Contractor will be made for a decrease in costs.

The sum of money shown on the estimate, and in the itemized proposal as "Estimated Cost", for this item will be considered the bid price although payment will be made as described above. The estimated cost figure is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

**ITEM #0507264A – SPECIAL TYPE “C-L” CATCH BASIN DOUBLE
GRATE - TYPE II**

Work under this item shall conform to the construction plans and miscellaneous details, CTDOT Standard Sheets applicable for Type “C-L” Catch Basin Double Grate – Type II, and to the requirements of Section 5.07 of the ConnDOT Standard Specifications, Form 816, supplemented and amended as follows:

Article 5.07.03 – Construction Methods: *Add the following:* Contractor shall submit shop drawings for the Engineer’s review. Shop drawings shall be stamped by a Professional Engineer licensed in the State of Connecticut.

Pay Item
Special Type “C-L” Catch Basin Double Grate – Type II

Pay Unit
EA

ITEM #0520036A – ASPHALTIC PLUG EXPANSION JOINT SYSTEM

Description: Work under this item shall consist of furnishing and installing an asphaltic plug expansion joint system (APJ) in conformance with ASTM D6297, as shown on the plans, and as specified herein.

Work under this item shall also consist of the removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, cleaning and sealing median barrier joints, parapet joints, and sidewalk joints.

Work under this item excludes the removal of Portland cement concrete headers.

Materials: The APJ component materials shall conform to ASTM D6297 and the following:

Aggregate: The aggregate shall meet the following requirements:

- a) Loss on abrasion: The material shall show a loss on abrasion of not more than 25% using AASHTO Method T96.
- b) Soundness: The material shall not have a loss of more than 10% at the end of five cycles when tested with a magnesium sulfate solution for soundness using AASHTO Method T 104.
- c) Gradation: The aggregate shall meet the requirements of Table A below:
- d) Dust: aggregate shall not exceed 0.5% of dust passing the #200 sieve when tested in accordance with AASHTO T-11.

Table A

<u>Square Mesh Sieves</u>	1" (25.0 mm)	¾" (19.0 mm)	½" (12.5 mm)	⅜" (9.5 mm)	No. 4 (4.75 mm)
% passing	100	90 - 100	20 - 55	0 - 15	0 - 5

A sample of the aggregate shall be submitted to the Department with a Certified Test Report in accordance with Article 1.06.07 for each 20 tons of loose material or its equivalent number of bags delivered to the job site. The Certified Test report must include a gradation analysis resulting from a physical test performed on the actual material that accompanies the report.

Anti-Tacking Material: This material shall be a fine graded granular material with 100% passing the ⅜" sieve and no more than 5% passing the #200 when tested in accordance with AASHTO T-27.

Backer Rod: All backer rods shall satisfy the requirements of ASTM D5249, Type 1.

Bridging Plate: The bridging plates shall be steel conforming to the requirements of ASTM A36 and be a minimum ¼" thick and 8" wide. For joint openings in excess of 3" the minimum plate dimensions shall be ⅜" thick by 12" wide. Individual sections of plate shall

not exceed 4' in length. Steel locating pins for securing the plates shall be size 16d minimum, hot-dip galvanized, and spaced no more than 12" apart.

Concrete Leveling Material: Shall be a cementitious-based material that conforms to ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair, for R3 performance requirements in Table 1 and achieve the following:

- a. Final set in 45 Minutes
- b. 2500 psi compressive strength in 24 hours
- c. 5000 psi compressive strength in 7 days

Parapet Sealant: The sealant used in parapet joint openings shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Sidewalk Sealant: The sealant used in sidewalk joint openings shall be a rapid cure, self-leveling, cold applied, two-component silicone sealant. The silicone sealant shall conform to the requirements listed in Table B:

Table B

Properties - As Supplied	Test Method	Requirement
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
Properties - Mixed	Test Method	Requirement
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 ^{1,2,3}	600% min
Joint Modulus @ 100% elongation	ASTM D5329 ^{1,2,3}	15 psi max
Cure Evaluation	ASTM D5893	Pass @ 5 hours

1. Specimens cured at $77 \pm 3^{\circ}\text{F}$ and $50 \pm 5\%$ relative humidity for 7 days
2. Specimens size: $\frac{1}{2}$ " wide by $\frac{1}{2}$ " thick by 2" long
3. Tensile Adhesion test only

The date of manufacture shall be provided with each lot. No sealant shall be used beyond its maximum shelf-life date.

The two-part silicone sealants shown in Table C are known to have met the specified requirements:

Table C

Product	Supplier
Dow Corning 902RCS	Dow Corning Corporation 2200 W Salzburg Road Auburn, Michigan 48611
Wabo SiliconeSeal	BASF/Watson Bowman Acme Corporation 95 Pineview Drive Amherst, New York 14228

Other two-component silicone joint sealants expressly manufactured for use with concrete that conform to the aforementioned ASTM requirements will be considered for use provided they are submitted in advance for approval to the Engineer. Other joint sealants will be considered for use only if a complete product description is submitted, as well as documentation describing at least five installations of the product. These documented installations must demonstrate that the product has performed successfully for at least three years on similar bridge expansion joint applications.

A Materials Certificate and Certified Test Report for the asphaltic binder shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07 certifying that the asphaltic binder satisfies the requirements of the most current version of ASTM D6297.

A Materials Certificate for all other components of the APJ, leveling material, backer rod and sealant used in sealing parapet and sidewalk joint openings, shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods: The APJ shall be installed at the locations shown on the plans and in stages in accordance with the traffic requirements in the special provisions “Maintenance and Protection of Traffic” and “Prosecution and Progress”.

At least 30 days prior to start of the work, the Contractor shall submit to the Engineer for approval a detailed Quality Control Plan for the installation of the APJ. The submittal shall include:

- a) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the asphaltic binder, anti-tack material, backer rod, sealant, leveling material, as well as the aggregate's source.
- b) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation. The Quality Control Plan must fully comply with the specifications and address all anticipated field conditions, including periods of inclement weather.

The APJ shall not be installed when bituminous concrete overlay or joint cutout is wet. The APJ shall only be installed when the bridge superstructure surface temperature is within the limits specified in Table D and when the ambient air temperature is within the range of 45°F to 95°F.

The bridge superstructure surface temperature range is determined using the thermal movement range provided on the contract plans for the proposed APJ deck installation location and the selected APJ product.

Table D

Installation Restrictions	
Designed Deck Joint Thermal Movement Range²	Bridge Superstructure Surface Temperature¹
0" to 1"	45° F to 95° F
1-1/8"	45° F to 90° F
1-1/4"	45° F to 80° F
1-3/8"	45° F to 70° F
1-1/2"	45° F to 65° F

1. The superstructure surface temperature shall be determined from the average of three or more surface temperature readings taken at different locations on the interior girder surfaces by the Contractor as directed by the Engineer. Temperature measurements of the superstructure shall be taken by the contractor with a calibrated hand held digital infrared laser-sighted thermometer on the surfaces of an interior steel girder, or interior concrete girder protected from direct sunlight. The infrared thermometer to be supplied by the Contractor for this purpose shall meet certification requirements of EN61326-1, EN61010-1, and EN60825-1 maintained by the European Committee for Electrotechnical Standardization (CENELEC). The thermometer shall have a minimum distance-to-spot ratio of 50:1 and shall have adjustable emissivity control. The thermometer shall have a minimum accuracy value of $\pm 1\%$ of reading or $\pm 2^{\circ}\text{F}$, whichever is greater. The thermometer shall be used in strict accordance with the manufacturer's written directions. An additional infrared thermometer satisfying the same standards to be used in this application shall also be provided to the Engineer for quality assurance purposes.
2. Linear interpolation may be used to determine an allowable surface temperature range for thermal movement ranges in between values shown in the table, as approved by the Engineer.

Prior to installing the APJ, the Contractor shall determine the exact location of the deck joint beneath the bituminous concrete overly.

The APJ shall be installed symmetrically about the deck joint opening to the dimensions shown on the plans or as directed by the Engineer; not to exceed 24 inches measured perpendicular to the deck joint. The proposed saw cut lines shall be marked on the bituminous concrete overlay by the Contractor and approved by the Engineer, prior to saw-cutting. The saw-cuts delineating the edges of the APJ shall extend full depth of the bituminous concrete overlay.

The existing bituminous concrete overlay, waterproofing membrane and/or existing expansion joint material, within the saw cut limits shall be removed and disposed of by the Contractor to create the joint cutout.

Concrete surfaces that will support the bridging plates shall be smooth and form a plane along and across the deck joint. Rough or damaged concrete surfaces shall be repaired with a leveling compound meeting the requirements of this specification. Deteriorated concrete areas within the joint limits shall be repaired as directed by the Engineer: such repairs, when deemed necessary by the Engineer, shall be compensated for under the applicable concrete deck repair items in the Contract. The existing and repaired concrete surfaces shall provide continuous uniform support for the bridging plate and prevent the plate from rocking and deflecting.

Prior to the installation of the backer rod, all horizontal and vertical surfaces of the joint cutout shall be abrasive blast cleaned using an oil-free, compressed air supply. The entire cutout shall then be cleared of all loose blast media, dust, debris and moisture using an oil-free, hot air lance capable of producing an air stream at 3,000°F with a velocity of 3,000 feet per second.

A single backer rod, with a diameter at least 25% greater than the existing joint opening at the time of installation, shall be installed at an inch below the bridging plate in the existing deck joint opening between the concrete edges.

Asphaltic binder shall be heated to a temperature within the manufacturer's recommended application temperature range which shall be provided in the Quality Control Plan. During application, the temperature of the binder shall be maintained within this range. In no case shall the temperature of the binder go below 350° F nor exceed the manufacturer's recommended maximum heating temperature.

Asphaltic binder shall then be poured into the joint opening until it completely fills the gap above the backer rod. A thin layer of binder shall next be applied to the all horizontal and vertical surfaces of the joint cutout.

Bridging plates shall be abrasive blast-cleaned on-site prior to installation and then placed over the deck joint opening in the joint cutout. The plates shall be centered over the joint opening and secured with locating pins along its centerline. The plates shall be placed end to end, without overlap, such that the gap between plates does not exceed 1/4". The plates shall extend to the gutter line and be cut to match the joint's skew angle, where concrete support exists on both sides of the joint. Within APJ installation limits, where concrete support does not exist at both sides of the joint opening (such as where a bridge deck end abuts a bituminous concrete roadway shoulder), bridging plates shall not be installed. Installed bridging plates shall not rock or deflect

in any way. After installation of bridging plates, a thin layer of asphaltic binder shall be applied to all exposed surfaces of the plates.

The remainder of the joint cutout shall then be filled with a mixture of hot asphaltic binder and aggregate prepared in accordance with the submitted Quality Control Plan and the following requirements:

- The aggregate shall be heated in a vented, rotating drum mixer by the use of a hot-compressed air lance to a temperature of between 370° F. to 380° F. This drum mixer shall be dedicated solely for the heating and, if necessary, supplemental cleaning of the aggregate. Venting of the gas and loose dust particles shall be accomplished through ¼" drilled holes spaced no more than 3" on center in any direction along the entire outside surface of the drum
- Once the aggregate has been heated, it shall then be transferred to a secondary drum mixer where it shall be fully coated with asphaltic binder. A minimum of two gallons of binder per 100lbs of stone is required.
- The temperature of the aggregate and binder shall be monitored by the contractor with a calibrated digital infrared thermometer.
- The coated aggregate shall be loosely placed in the joint cutout in lifts not to exceed 2 inches.
- Each lift shall be leveled, compacted and then flooded with hot asphaltic binder to the level of the aggregate to fill all voids in the coated aggregate layer. The surface of each lift shall be flooded until only the tips of the aggregate protrude out of the surface.
- The final lift shall be placed such that no stones shall project above the level of the adjacent overlay surface following compaction of the coated aggregate.
- Following installation of the final lift, sufficient time and material shall be provided to allow all voids in the mixture to fill. This step may be repeated as needed.
- The joint shall then be top-dressed by heating the entire area with a hot-compressed air lance and applying binder. The final joint surface must be smooth with no protruding stones and be absent of voids.
- Once top-dressed, the joint shall have an anti-tack material spread evenly over the entire surface to prevent tracking.

The Contractor shall be responsible for removing all binder material that leaks through the joint and is deposited on any bridge component, including underside of decks, headers, beams, diaphragms, bearings, abutments and piers.

Traffic shall not be permitted over the joint until it has cooled to 130° F when measured with a digital infrared thermometer. Use of water to cool the completed joint is permitted.

Sidewalk, parapet, and/or curb joint openings

Before placement of any sealing materials in parapets, curbs, or sidewalks, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust, or other foreign matter by abrasive blast cleaning. Residual dust and moisture shall then be removed by blasting with oil free

compressed air using a hot air lance. Projections of concrete into the joint space shall also be removed. The backer rod shall be installed in the joint as shown on the plans. The joint shall be clean and dry before the joint sealant is applied. Under no circumstances is the binder material to be used as a substitute for the joint sealant.

Whenever abrasive blast cleaning is performed under this specification, the Contractor shall take adequate measures to ensure that the abrasive blast cleaning will not cause damage to adjacent traffic or other facilities.

The joint sealant shall be prepared and placed in accordance with the manufacturer's instructions and with the equipment prescribed by the manufacturer. Extreme care shall be taken to ensure that the sealant is placed in accordance with the manufacturer's recommended thickness requirements.

The joint sealant shall be tooled, if required, in accordance with the manufacturer's instructions.

Primer, if required, shall be supplied by the sealant manufacturer and applied in accordance with the manufacturer's instructions.

When the sealing operations are completed, the joints shall be effectively sealed against infiltration of water. Any sealant which does not effectively seal against water shall be removed and replaced at the Contractor's expense.

Any installed joint that exhibits evidence of failure, as determined by the Engineer, such as debonding, cracking, rutting, or shoving of the APJ mixture shall be removed and replaced full-width and full-depth to a length determined by the Engineer at no additional cost to the State.

Method of Measurement: This work will be measured for payment by the number of cubic feet of "Asphaltic Plug Expansion Joint System" installed and accepted within approved horizontal limits. No additional measurement will be made for furnishing and installing backer rod and joint sealant in the parapets, concrete medians, curbs and/or sidewalks.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot for "Asphaltic Plug Expansion Joint System," complete in place, which price shall include the saw-cutting, removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, the furnishing and placement of the leveling compound, cleaning of the joint surfaces, furnishing and installing bridging plates, the furnishing and installing of the asphaltic plug joint mixture, the cost of furnishing and installing joint sealant in the parapets, concrete medians, curbs and sidewalks, and all other materials, equipment including, but not limited to, portable lighting, tools, and labor incidental thereto. No additional payment shall be made for the 12" wide bridging plates that are required for deck joint openings with widths in excess of 3".

If directed by the Engineer, additional deck repairs will be addressed and paid for under the applicable concrete deck repair items in the Contract.

ITEM #0601318A – PARTIAL DEPTH PATCH

Description: Work under this item shall consist of the removal of spalled, delaminated or otherwise deteriorated concrete from existing bridge decks and/or approach slabs by hydro-demolition methods, and replacement with fast setting patching material as shown on the plans, as directed by the Engineer, and hereinafter specified.

Where ordered by the Engineer, work under this item shall also include repairing pop-outs on the underside of the deck caused by the removal of deteriorated concrete.

Work under this item shall also include the furnishing and installation of reinforcing bar wire ties and vertical supports on inadequately supported and/or vibrating reinforcing steel within deck patch areas, as ordered by the Engineer.

Materials: The materials shall conform to the following requirements:

1) Patching Material: The patching material shall be a concrete composed of a quick setting cement, fine aggregate, coarse aggregate and water. This concrete shall harden within 40 minutes, and develop minimum compressive strengths of 1,000 psi within one hour after set and 3,000 psi within three days.

The Contractor shall design and submit a quick setting mix to the engineer for approval. The mix proportions and method of application shall be in accordance with the manufacturer's recommendations. Sources of supply of all the materials shall be clearly indicated.

Fine aggregate shall conform to the requirements of Subarticle M.03.01-2.

The coarse aggregate shall conform to the requirements of Subarticle M.03.01-1. The required grading shall be obtained by using 100 percent of No. 67 size coarse aggregate. Grading of the aggregate shall conform to the gradation table of Article M.01.01.

Water shall conform to the requirements of Subarticle M.03.01-4.

Unless otherwise approved by the Engineer, the quick setting cement shall be one of the following materials:

Gypsum Based Materials:

Duracal
United States Gypsum Co.
Chicago, IL 60680
800-296-6770

Five Star Concrete Patch
U.S. Grout Corporation
Fairfield, CT 06430
203-336-7900

FOX 928

Fox Industries, Inc.
Baltimore, MD 21211
410-243-8856

IFSCEM 110

American Stone Mix, Inc.
8320 Bellona Avenue
Towson, MD 21204
410-296-6770

Cementitious Based Materials:

Emaco T-415

Master Builders, Inc.
23700 Chagrin Blvd.
Cleveland, OH 44122
800-628-7378

Perma-Patch

Dayton Superior Corporation
PO Box 355
Oregon, IL 61061
800-745-3707

Rapid Set DOT Cement

CTS Cement Manufacturing
1023 Dogwood Lane
West Chester, PA 19382
215-429-4956

Speed Crete Green Line

Tamms Industries
730 Casey Ave.
Wilkes-Barre, PA 18702
800-218-2667

Fastcrete

Silpro Corporation
2 New England Way
Ayer, MA 01432
508-772-4444

Other patching products not currently approved by the Department may also be substituted provided that the Contractor submits to the Department the manufacturer's literature and a sufficient quantity of the proposed patching materials for field testing and evaluation. Further information regarding approval procedures may be obtained by contacting the Department's Research and Materials Testing Laboratory at 280 West Street, Rocky Hill, CT 06067. No substituted patching material shall be used until it has been approved in writing by the Department.

2) Epoxy Resin: The epoxy resin shall be a two component system. The base polymer shall be a thermosetting resin of the epoxy type. The epoxy resin shall be composed of 100% reactive constituents, which are a condensation product of the reaction of epichlorohydrin with bisphenol ether of bisphenol A, containing no more than trace amounts of hydrolyzable chloride. The epoxy resin shall have an epoxide equivalent between 465 and 530.

The reacting system shall consist of a blend of condensation polymers of dimerized and trimerized unsaturated fatty acids and an aliphatic polyamine.

Unless otherwise specified, pigmentation shall be required in the system so that the cured coating shall conform to the Federal Color Standard 595, No. 16357.

a) Physical Requirements of (Mixed) Epoxy Resin System:

A mixture of both components in the proportions recommended by the manufacturer shall conform to the following requirements:

Viscosity - 500 to 800 centipoises at 77°F
Pot life - 7 hours minimum at 75°F
Minimum solids content - 48%

The cured system shall not exhibit amine blushing or sweating.

When testing for abrasion by ASTM Designation D968, the pigmented finish coats shall require a minimum of 50 liters of sand to abrade a one mil thickness of coating.

A 2 ½ mil dry film thickness of the coating tested according to ASTM Designation D522 shall pass a 1/8 inch diameter mandrel test without splitting the film or causing loss of bond.

b) Sampling:

A representative sample of each component sufficient for the test specified shall be taken by a Department representative either from a well-blended bulk lot prior to packaging or by withdrawing 3 fluid ounce samples from no less than 5 percent by random selection of the containers comprising the lot or shipment. Unless the samples of the same component taken from containers show evidence of variability, they may be blended into a single composite sample to represent that component. The entire lot of both components may be rejected if samples submitted for test fail to meet any requirements of this specification.

c) Packaging and Marking:

The two components of the epoxy resin system furnished under these specifications shall be supplied in separate containers, which are non-reactive with the materials contained therein. The size of the container shall be such that the recommended proportions of the final mixture can be obtained by combining one container of one component with one or more whole containers of the other component.

Containers shall be identified as base polymer and reacting system, and shall show the mixing directions and usable temperature range as defined by these specifications. Each container shall be marked with the name of the manufacturer, the lot or batch number, the date of packaging, pigmentation if any, and the quantity contained therein in pounds and gallons.

Printed instructions from the manufacturer for mixing and applying the material shall be included.

Potential hazards shall be so stated on the package in accordance with the Federal Hazardous Products Labeling Act.

d) Control of Materials:

A Materials Certificate will be required in accordance with Article 1.06.07, certifying the conformance of the epoxy resin to the requirements set forth in this specification.

Construction Methods:

1) Inspection of the Structural Slab: Before any existing concrete is removed from the structural slab, the Contractor will provide the Engineer clear access to the bridge deck. During this time, the Engineer will perform an inspection of the structural slab and designate areas where concrete removal will be required. Due to the nature of the operations, the inspection can be performed only after some existing materials, notably overlays and waterproofing systems, have first been removed from the structural slab. It shall be the responsibility of the Contractor to arrange the construction schedule so that the required operations may be performed without causing delay to the work.

No operations will be performed by the Engineer until after the following construction work has been completed:

- a) The existing bituminous overlay or concrete wearing course, if present, has been removed.
- b) The existing waterproofing system, if present, has been removed.

Note: The removal of this material will be paid for under other applicable items.

It shall be the responsibility of the Contractor to inform the Engineer, in writing, of the date that a structure will be available for inspection operations. Notification shall be given to the Engineer at least seven (7) days prior to the date that the area in question will be in a condition acceptable to the Engineer.

The Contractor is hereby informed that the following time period will be necessary to perform the required inspection operations:

One working day with suitable weather conditions per each six thousand square feet, or portion thereof, of structural slab area.

The Contractor will not be allowed to do any further work to the structural slab, until all necessary inspection operations have been performed, unless given permission by the Engineer.

The Contractor will include any costs related to the allowance for this inspection in the general cost of the work.

2) Hydro-Demolition Water and Equipment: All hydro-demolition equipment should be capable of selectively removing spalled, delaminated or otherwise deteriorated concrete and cleaning the existing reinforcing steel of all rust and corrosion products by use of high-velocity water jets acting under continuous automatic control.

The hydro-demolition equipment shall consist of filtering and pumping units operating in conjunction with a remote-controlled robotics device

All hydro-demolition equipment shall be equipped with an angled and rotating water nozzle to prevent interference of the existing reinforcing steel with the removal of concrete.

The maximum allowable noise level caused by equipment used for the removal of deck concrete shall not exceed ninety (90) decibels on the "A" weighted scale, as measured at the nearest residence or occupied building. The Contractor shall demonstrate, to the satisfaction of the Engineer, that his equipment will meet this requirement before the use of such equipment will be allowed.

The make and model numbers of hydro-demolition equipment shall be submitted for approval by the Engineer. No hydro-demolition work shall be initiated until approval by the Engineer is granted.

The Contractor shall provide structurally adequate shields approved by the Engineer for protection of adjacent traffic lanes in the vicinity of the removal and cleanup operations.

Water used for the hydro-demolition shall be potable.

The Contractor is advised that the withdrawal of more than 50,000 gallons of water per day from a single source other than from a municipal water system shall require a diversion permit issued by the Department of Environmental Protection, Water Resources Unit, in accordance with the Connecticut Water Diversion Policy Act PA 84-402, CGS Sections 22a-365 through 22a-378.

3) Hydro-Demolition Drainage Runoff Control: At least two weeks prior to the planned initiation of hydro-demolition operations, the Contractor shall submit to the Engineer for approval a comprehensive plan for the containment, filtration and disposal of hydro-demolition runoff water and concrete debris.

The plan shall ensure that all concrete debris and particulant matter will be removed from hydro-demolition runoff water prior to its release to the environment.

The plan shall include provision for the concurrent vacuuming of all runoff water at the immediate vicinity of the hydro-demolition operation. Runoff water shall be completely contained and vacuumed into a suitably sized water tight mobile tank for transport to a disposal site sedimentation basin approved by the Engineer.

Hydro-demolition operations shall proceed only with the simultaneous operation of a runoff water vacuum pickup in the immediate area of the hydro-demolition operation. Runoff water shall not be allowed to flow across adjacent travel lanes, across bridge joints nor through any existing bridge drainage system.

The size and location of the disposal site sedimentation basin shall be detailed in the containment, filtration and disposal plan. The sedimentation basin shall be properly sized so that uncontrolled overflow does not occur. At the conclusion of hydro-demolition operations, the sedimentation basin and all concrete debris shall be removed and the area restored to its original condition.

The plan shall additionally conform to all applicable requirements of Section 1.10 Environmental Compliance of the Standard Specification.

The approval by the Engineer of the runoff containment, filtration and disposal plan shall in no way relieve the Contractor of any responsibility for its safe and effective performance.

4) Calibration and Testing of Hydro-Demolition Equipment: A trial area shall be designated by the Engineer to demonstrate that the equipment, personnel and methods of operation are capable of producing results satisfactory to the Engineer. The trial area shall consist of two patches, each of approximately 20 square feet, one area deteriorated and/or defective concrete and one area of "sound" concrete as determined by the Engineer.

Area of sound concrete is defined as: An area free from chemical defects, delamination, spalling, cracks, etc.

In the "sound area of concrete", the equipment shall be programmed to remove concrete to a depth 1 inch \pm 1/4 inch below the top reinforcing steel mat.

After completion of the above test area, the equipment shall be located over the deteriorated and/or defective concrete and using the same parameters for sound concrete removal, remove all deteriorated and/or defective concrete. If a satisfactory result is obtained, these parameters may be used as a basis for the production removal.

If, after calibrating the hydro-demolition equipment and beginning removal operations in a particular zone or area, insufficient removal of concrete is being obtained in the opinion of the Engineer, the Contractor shall recalibrate the hydro-demolition equipment for that zone or area to the satisfaction of the Engineer.

5) Removal of Deteriorated Concrete: All deteriorated concrete designated for removal under this construction item shall be removed within the limits shown on the plans and where ordered by the Engineer. The lateral limits of each area to be repaired will be delineated by the Engineer and suitably marked. Where several areas to be repaired are very close together, the Engineer may combine these individual patches into a large area. The outlines of each such area

shall first be cut to a depth of one-half (1/2) inch with an approved powersaw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper 1/2 inch depth during sawing operations, the depth of saw-cut shall immediately be adjusted to a shallower depth so as not to damage the steel bars. If so directed by the Engineer, saw cutting shall again be carried down to the 1/2 inch depth at other locations of repair provided reinforcing steel is not again encountered. Where over-breakage occurs resulting in a featheredge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the area shall be outlined by chisel or other approved means.

All deteriorated concrete shall be removed by hydro-demolition methods except under the following circumstances where pneumatic hammers may be used when approved by the Engineer:

- a) The removal of any remaining thin concrete ridges or “shadows” directly beneath reinforcing bars.
- b) When necessary to achieve required clearance around lap splices in the repair of deteriorated or damaged reinforcing steel.
- c) In areas inaccessible to hydro-demolition.
- d) The removal of deteriorated concrete for deck repair areas less than 10% of surface area per span.

The weight of pneumatic hammers when used shall not exceed 30 pounds for concrete removal above the top reinforcing steel nor 15 pounds for concrete removal below the top reinforcing steel.

The depth of concrete removal shall be at least 1 inch below the top reinforcing steel mat but shall be such as to include all spalled, delaminated, or otherwise deteriorated concrete. The Engineer will be sole determiner of what constitutes deteriorated concrete, using sounding methods or other evaluation measures at his discretion.

Within one hour following the initiation of a hydro-demolition operation in any patch area, all loose concrete debris should be removed, followed by water flushing of the existing concrete bonding surface to completely remove all traces of concrete debris and cement residue so that rebonding to the surface of the remaining sound concrete will be prevented. If it is not convenient to clean and flush the patch area within this time framework, all steel reinforcing and concrete bonding surfaces shall be cleaned subsequently by high pressure water blasting at a nozzle pressure not less than 3,000 psi with a sufficient volume to completely remove all rebonded debris and laitance.

Where pneumatic hammers are used, the minimum depth of removal shall be no more than 1 inch shallower than any adjacent hydro-demolished deck excavation.

Where the existing reinforcing steel is damaged or corroded, it shall be cut out and replaced with new reinforcing steel of the same size. Any sound reinforcing steel damaged during the concrete removal operations, shall be repaired or replaced by the Contractor at his expense as directed by the Engineer. New steel shall be attached beneath or beside existing steel with a minimum splice length as indicated on the plans, or as directed by the Engineer. The concrete shall be removed to a minimum depth of 1 inch below the new steel.

6) Surface Preparation: Sound reinforcing steel which is in the proper position in the slab shall be left in place and cleaned of all concrete, the smaller fragments to be removed with hand tools in patch areas where pneumatic hammers were used.

Reinforcing bar wire ties and vertical supports shall be installed on inadequately supported and/or vibrating reinforcing steel, as directed by the Engineer.

The concrete surface and reinforcing steel to receive patching material shall be either sandblasted or water blasted, followed by air blasting in order to remove all loose particles and dust. All blasting operations shall be performed using techniques approved by the Engineer, taking care to protect all pedestrians, traffic, and adjacent property. All compressed air sources shall have properly sized and designed oil separators, attached and functional, to allow delivered air at the nozzle to be oil-free. The patch area shall be cleaned of all additional loose or powder-like rust, oil, solvent, grease, dirt, dust, bitumen, loose particles, and foreign matter just prior to patching.

If the patch area was not cleaned and flushed with clean water immediately following hydro-demolition, or if run-off from a nearby hydro-demolition operation was allowed to travel through the previously cleaned and flushed patch surface, all affected concrete and steel reinforcing bonding surfaces shall be water blast cleaned at a nozzle pressure not less than 3,000 psi as directed by the Engineer, to assure that all remaining bond inhibiting laitance is completely removed.

The entire concrete surface to be patched shall be dampened. All free water shall be removed from the patch area.

7) Mixing, Placing, and Finishing: Mixing and placing concrete should not be done unless the ambient temperature is above 35°F. All mixing shall be accomplished by means of a standard drum-type portable mixer. A continuous type mobile mixer may be used if permitted by the Engineer. The Contractor shall calibrate the mobile mixer under supervision of the Engineer. Calibration shall be in accordance with the applicable sections of ASTM method C685. The total mix shall be limited to the quantity that can be mixed and placed in 15 minutes. The concrete mix shall be spread evenly and compacted to a level slightly above the pavement surface. Vibration, spading or rodding shall be used to thoroughly compact concrete and fill the entire patch area. Where practical, internal vibration shall be used in cases where concrete has been removed below the reinforcing steel. Hand tamping shall be used to consolidate concrete in smaller patches, including popouts.

Vibrating plates or vibrating screeds shall be used on the surface of all patches for strike off and consolidation. After the concrete has been spread evenly and compacted to a level slightly above the pavement surface, the vibrating plate or screed shall be drawn over the surface at a uniform speed without stopping, in order to finish the surface smooth and even with adjacent concrete.

The surface shall be float finished.

Finishing operations shall be completed before initial set takes place.

Cured patches, having a hollow sound when chain dragged or tapped (indicating delamination), shall be replaced by the Contractor at his expense until a patch acceptable to the Engineer is in place.

8) Tolerances in Finished Patched Surfaces: The surface profile of the patched area shall not vary more than one-eighth inch in a distance of 10 feet, when a 10 foot long straightedge is placed on the surface at any angle relative to the centerline of the bridge. Humps in the patch that exceed the one-eighth inch tolerance shall be ground down by approved machinery. Sags or depressions in the surface of the patch area that exceed one-eighth inch tolerance shall be repaired by removal of the concrete in the depression over an area determined by the Engineer to a depth of one inch and repaired in the previously described manner.

9) Underside of Bridge Deck Treatment: The Engineer shall examine the underside of the bridge deck for pop-outs caused by the removal of deteriorated concrete. The surface area of pop-outs shall be coated with epoxy resin where ordered by the Engineer. The concrete surface and exposed reinforcing steel, if any, which is to receive the coating material shall be cleaned of all loose or powder-like rust, oil, dust, dirt, loose particles, and other bond inhibiting matter just prior to coating.

The epoxy resin shall be mixed in accordance with the manufacturer's instructions. Also in accordance with the manufacturer's instructions, two coats of the mixed material shall be applied in uniform coats of approximately 2 to 3 mil dry film thickness each.

If the pop-outs extend beyond the bottom layer of reinforcing steel, the pop-outs shall be repaired as ordered by the Engineer.

10) Test Cylinders: The Contractor shall make and perform compressive strength tests on representative cylinders under the supervision of the Engineer. The dimensions, type of cylinder mold and number of cylinders shall be specified by the Engineer. Traffic shall not be permitted on patched surfaces until the patch material attains a strength of 1800 psi, as determined by breaks of the test cylinders.

A portable compression testing machine shall be provided by the Contractor and available on site for cylinder testing. All testing and equipment shall conform to ASTM C39.

Note: This compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

11) Time Schedule: Work under this item begun on any specific bridge during a construction season shall be completed, at least, to include this item, membrane waterproofing and placing of first course of wearing surface as soon as possible and specifically before the beginning of the construction season's winter shutdown.

All work shall proceed as required by the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications elsewhere within the contract documents. Traffic will not be allowed on any areas where the Contractor has removed deteriorated concrete until a minimum of 1.5 hours after the placing and finishing operations on the areas are complete as required by this specification.

Method of Measurement: This work will be measured for payment by the actual number of cubic feet of patching material used in acceptable concrete deck patches, except where the Engineer determines that the Contractor has unnecessarily removed sound concrete. Where sound concrete has been unnecessarily removed, the replacement concrete will not be measured for payment.

The actual number of cubic feet of patching material will be determined by the actual product yield per bag based upon the Contractor's mix design as determined by the Department's Material Testing Lab.

The Contractor shall provide the Engineer with a statement certifying the number of bags of patching material incorporated into the work.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot of deck concrete repaired for "Partial Depth Patch", complete in place and accepted, which price shall include removal of deteriorated concrete, surface preparation of patch areas, epoxy resin coating of the underside of deck pop-out surfaces, concrete replacement, the furnishing and installation of reinforcing bar wire ties and vertical supports for inadequately supported existing reinforcing steel, all materials, equipment, including the portable compression testing machine required for the testing of the repair material, tools, labor and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Partial Depth Patch	C.F.

ITEM #0602040A – FIBER REINFORCED POLYMER REINFORCING BARS

Description: Work under this item shall consist of furnishing and placing fiber-reinforced polymer (FRP) reinforcing bars and FRP headed anchor bars, of the type and size designated, as shown on the plans, as directed by the Engineer and in accordance with these specifications.

Materials: The materials for this work shall conform to the following requirements:

1. Bar Reinforcement: Bar reinforcement shall be deformed or sand-coated, or both, and shall be composite materials made of continuous aramid FRP (AFRP), carbon FRP (CFRP) or glass FRP (GFRP) fibers embedded in a polymeric resin.

GFRP bars shall conform to the requirements of Section 4 – Material Specifications of AASHTO LRFD Bridge Design Guide Specifications for GFRP-Reinforced Concrete Bridge Decks and Traffic Railings, the latest edition available prior to the advertising date of the contract, and these specifications. All other FRP bars shall conform to the testing requirements of ACI 440.3R “Guide Test Methods for Fiber-Reinforced Polymer (FRP) Composites for Reinforcing or Strengthening Concrete and Masonry Structures,” the latest edition available prior to the advertising date of the contract, and these specifications.

2. Bar Sizes and Properties: Listed below are the bar sizes with approximate diameters and areas.

TABLE 1 - ASTM Standard Reinforcing Bars

Bar Designation No. (**)	Nominal Dimensions (*)	
	Nominal Diameter, in.	Area, in. ²
No. 2	0.250	0.05
No. 3	0.375	0.11
No. 4	0.500	0.20
No. 5	0.625	0.31
No. 6	0.750	0.44
No. 7	0.875	0.60
No. 8	1.000	0.79
No. 9	1.128	1.00
No. 10	1.270	1.27

* The nominal dimensions of a deformed FRP bar is equivalent to those of a plain round bar having the same weight pound per foot as the deformed bar.

**Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars

TABLE 2 - Typical Densities (lb/ft³)

GFRP	CFRP	AFRP
125	98	86

TABLE 3 – Minimum Modulus of Elasticity – ACI 440.1R-06 (psi.)

GFRP	5,700,000
AFRP	10,000,000
CFRP	16,000,000

TABLE 4 – Minimum Tensile Strength (psi.)

Bar Designation No.	Minimum Tensile Strength Reported by Manufacturer
2	110,000
3	110,000
4	100,000
5	95,000
6	90,000
7	85,000
8	80,000
9	75,000
10	70,000

3. Headed Anchor Bars: The following FRP headed anchor bar products or approved equal shall be used for this item:

Product	Supplier
V.ROD	Pultrall Inc. 632B, Heritage Village Southbury, CT 06488
Schöck ComBAR®	Schöck USA Inc. 100 Overlook Center, 2 nd floor Princeton, NJ 08540

FRP headed anchor bars shall have the minimum pull out strength as shown on the plans.

4. Dowel Bar Mechanical Connections: Dowel bar mechanical connections are not permitted.

5. Reinforcement Supports and Tie Wires: Reinforcement supports shall be galvanized or made of dielectric material or, if ferrous, coated with dielectric material, including epoxy or another polymer.

Concrete supports shall have a surface area of not less than 4 square inches and a compressive strength and durability properties equal to or greater than the specified compressive strength of the concrete being placed.

Tie wires shall be plastic or polymer-coated wire. For applications requiring complete electromagnetic neutrality, FRP bars shall be tied in place using nylon or plastic wire (zip) ties. Alternatively, thermoplastic injection molded clips are permitted.

6. Sampling and Testing: Prior to incorporation into the work, samples of the FRP bar reinforcement shall be submitted to the Engineer for determination of the following mechanical and durability properties:

- a. Mechanical Properties: tensile strength, tensile modulus of elasticity, shear strength, tensile strain, and bond strength.
- b. Durability Properties: moisture absorption, resistance to alkaline environment and longitudinal wicking.

Minimum five samples of sufficient length to perform the required tests shall be submitted for each size, source of supply, and type of FRP bar reinforcement per each production lot.

7. Reports and Certification: Test reports and materials certification shall be submitted for all types of reinforcing bars confirming they meet the requirements of the applicable specifications. Materials Certificates shall be submitted in accordance with Article 1.06.07 for all types of FRP reinforcing bars.

Construction Methods:

1. Submittals:

(a) Shop Drawings: Prior to fabricating any materials, the Contractor shall submit shop drawings of the FRP reinforcing bars, with material lists, material designations, placement diagrams, bending diagrams and manufacturer's literature for headed anchors, for review, in accordance with Article 1.05.02.

(b) Reports and Certification: The Contractor shall submit the manufacturer's certified test reports and Material Certificates in accordance with Article 1.06.07 for all types of FRP reinforcing bars.

The test reports shall also include, but not be limited to, the following information:

- Test date and laboratory where testing was performed;
- Bar diameter;
- Production lot number;
- Mechanical properties as reported by the manufacturer: tensile strength, modulus of elasticity, transverse shear strength (perpendicular to the bar), bond strength, and strength of bent bars.

(c) Splices: The Contractor shall submit a list of splices and request to use splices not indicated in Contract Documents.

(d) Inspection and Quality Control: The Contractor shall submit QA/QC program of the plant manufacturing FRP reinforcement.

2. Fabrication:

(a) Cutting and Bending: Bar reinforcement shall be cut and bent to the shapes shown on the plans. Fabrication tolerances shall be in accordance with the requirements of ACI 117. All bars shall be bent before the resin is fully cured. Field bending or straightening of FRP bars shall not be permitted. Field forming of large-radius curves shall be permitted per manufacturer's specifications.

When necessary, field cutting shall be performed with a high-speed grinding cutter with a minimum no-load speed of 600 rpm or a fine-blade saw. Shear cutting of FRP bars shall not be permitted.

(b) Hooks and Bend Dimensions: The dimensions of hooks and the diameters of bends measured on the inside of the bar shall be as shown on the plans. When the dimensions of hooks or the diameter of bends are not shown, they shall be in accordance with the ACI 440.5, "Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars."

(c) Identification: Bar reinforcement shall be shipped in standard bundles. Each bundle shall be identified with a corresponding production lot number. Each bar shall be labelled with the following information:

- A symbol to identify the producer;
- A letter to indicate the type of fiber, which is "G" for glass, "C" for carbon, "A" for aramid and "H" for hybrid;
- The nominal bar diameter designation;
- A marking to indicate the tensile strength as reported by the manufacturer;
- A marking to indicate the modulus of elasticity.

3. Handling, Storing and Surface Condition of Reinforcement: FRP reinforcement shall be stored above the surface of the ground on platforms, skids, or other supports and shall be protected as far as practical from mechanical injury. If stored outdoors for more than two months, FRP reinforcing bars shall be covered with opaque plastic or other types of cover to protect the bars from ultra-violet rays. Bars or bundles shall not be dropped or dragged.

4. Placing and Fastening:

(a) General: FRP reinforcement shall be accurately placed as shown on the plans and firmly held in position during the placing and setting of concrete. Bars shall be tied at all intersections except where the spacing is less than 12 inches in each direction when alternate intersections shall be tied.

Bars shall be tied at all intersections around the perimeter of each mat. Bundled bars shall be tied together at not more than 6 foot centers. Lap splices shall have a minimum of 2 ties or be tied 12 inches apart for the length of the splice, whichever requires the greater number of ties.

Tie down bars shall be placed as shown on the plans and a top longitudinal reinforcing bar tied to these bars.

(b) Support Systems: FRP reinforcing bars shall be supported in its proper position by use of precast concrete blocks, wire bar supports, supplementary bars (tie-down bars), side form spacers or other approved devices. Such devices shall be sufficiently strong and properly placed at frequent intervals so as to maintain the cover between the reinforcing and the surface of the concrete. The reinforcing bar cover shall be no less than that shown on the plans and no greater than that shown plus 1/4 inch.

Platforms for the support of workers and equipment during concrete placement shall be supported directly on the forms and not on the reinforcing bars.

(c) Precast Concrete Blocks: Precast concrete blocks shall have a compressive strength not less than that of the concrete in which they are to be embedded. The face of the blocks in contact with forms for exposed surfaces shall not exceed 2 inches x 2 inches in size and shall have a color and texture that will match the concrete surface. Precast concrete blocks shall not be used on exposed surfaces of precast concrete members. When used on vertical or sloping surfaces, such blocks shall have an embedded wire for securing the block to the reinforcing. When used in slabs, either such a tie wire or, when the weight of the reinforcing is sufficient to firmly hold the blocks in place, a groove in the top of the block may be used.

(d) Wire Supports: The maximum spacing of slab bolster rows and high chair rows for concrete deck slabs shall be 4 feet unless otherwise directed by the Engineer.

(e) Field Forming of Large Radius Curves: Minimum allowable radius for field forming of FRP bars shall be in accordance with the fabricator's recommendations.

(f) Permitted Damage of FRP Reinforcing Bars: The maximum total unrepaired visible damage permitted on each linear foot of each FRP bar shall not exceed 2% of the surface area in that linear foot of bar. The depth of the permissible damage shall not exceed 0.04 inch.

(g) Repair of FRP Reinforcing Bars: Any damage to the FRP bars exceeding the permitted damage criteria shall be repaired by lap splicing a new FRP bar adjacent to the damaged portion with the appropriate lap length on either side of the damage. Lap lengths shall be shown on the plans.

5. Splicing of Bars:

(a) General: All reinforcement shall be furnished in the full lengths indicated on the plans unless

otherwise permitted. Except for splices shown on the plans, splicing of bars will not be permitted without written approval of the Engineer. Splices shall be staggered as far as possible.

(b) Lapped Splices: Lapped splices shall be of the lengths shown on the plans. In contact lap splices, the bars shall be placed in contact and tied together in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans. In non-contact lap splices, the bars shall be placed as shown on the plans and tied to adjacent bars in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.

6. Substitutions: Substitution of different size bars will be permitted only when authorized by the Engineer. The substituted bars shall have an area equivalent to or larger than the area shown on the plans.

7. Inspection: Reinforcement in any member or component shall be placed, inspected and approved by the Engineer before placing of concrete begins. Concrete placed prior to approval of the reinforcement may be rejected and its removal required.

Method of Measurement:

1. General: No measurement will be made for payment for any clips, wire, separators, wire chairs, precast mortar blocks and other material used for fastening and supporting the reinforcement in the correct position.

2. Bar Reinforcement: This work will be measured for payment by the number of pounds of FRP reinforcing bars installed and accepted. The weight of FRP reinforcing bars shall be computed using the density values tabulated in Table 1, Materials Section. Tie down bars will not be measured for payment. In case short bars are used when full length bars might reasonably be required, only the amount which would be obtained if full length bars were used will be measured for payment. No allowance will be made for lap splices not contemplated by the plans unless approved by the Engineer.

If bars are substituted upon the Contractor's request and as a result more FRP reinforcing bars are used than specified, only the amount specified will be included.

Basis of Payment: This work will be paid for at the contract unit price per pound for "Fiber Reinforced Polymer Reinforcing Bars" complete in place and accepted, including shop drawings, furnishing, fabricating and placing FRP reinforcing bars, and all materials, equipment, tools, labor and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Fiber Reinforced Polymer Reinforcing Bars	L.B.

ITEM #0602910A – DRILLING HOLES AND GROUTING DOWELS

Description: Work under this item consists of drilling holes in concrete and grouting dowels as shown on the plans, in accordance with the manufacturer's recommendations, and as directed by the Engineer. For the purpose of this specification, a dowel is defined as a reinforcing bar.

Materials: The chemical anchoring material shall conform to Subarticle M.03.07.

Construction Methods: Before fabricating any materials, the Contractor shall submit manufacturer's specifications and installation instructions for the chemical anchoring material to the Engineer for review in accordance with Article 1.05.02. This shall include, but not limited to, the type of drill, diameter of bit, method of cleaning holes and method of placement of the adhesive bonding material. The weight of the drill shall not exceed 15 pounds.

Holes for the dowels shall be located as shown on the plans. The holes shall clear the existing reinforcement and provide the minimum cover as shown on the plans. A pachometer shall be used to locate existing reinforcing steel. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated.

The depth and diameter of each hole shall be as shown on the plans. If the depth and diameter of a hole are not shown on the plans, the hole shall conform to the manufacturer's recommendations for the diameter of the dowel being anchored such that the grouted dowels will be able to develop a pull-out resistance of 125 percent of its nominal yield strength or 100 percent of its tensile strength, whichever is greater.

Hole drilling methods shall not cause spalling, cracking, or other damage to the existing concrete. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

Prior to placing the chemical anchoring material in the holes, the holes shall be cleaned of all dirt, moisture, concrete dust and other foreign material. The dowel and the chemical anchoring material shall be installed in the holes in accordance with the chemical anchoring material manufacturer's recommendations.

The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the area below, which may result in damage to any existing construction or to adjoining property. Should any damage occur to the structure as a result of the Contractor's operations, the Contractor shall make repairs at his own expense. The repair work shall be approved in advance and shall be of a quality acceptable to the Engineer.

Method of Measurement: This work will be measured for payment by the actual number of drilled holes in which dowels are embedded and accepted.

Basis of Payment: This work will be paid for at the contract unit price each for "Drilling Holes and Grouting Dowels," which price shall include drilling and preparing holes, furnishing and installing the chemical anchoring material in the holes and all material, equipment, tools and labor incidental thereto.

The cost for furnishing dowels shall be paid for under the item "Deformed Steel Bars - Galvanized".

<u>Pay Item</u>
Drilling Holes and Grouting Dowels

<u>Pay Unit</u>
e.a.

ITEM #0603170A – VIDEO DOCUMENTATION (SITE NO. 1)

Description:

This work consists of creating time-lapse videos from two vantage points documenting the construction of the structure at the subject Site from beginning-to-end as described in this specification and as directed by the Engineer.

Materials:

The Contractor shall provide two cameras that simultaneously capture 12-megapixel, or greater, color still photos automatically at an interval of at least one photo every 15 minutes. The still photos shall be submitted to the Department on a storage device and also be compiled into two separate high-definition (1080p) time-lapse videos. The equipment shall be sufficiently robust both physically and electronically to ensure quality images. The equipment shall have the capability to clearly record the activities, regardless of the site conditions, including but not limited to, extreme temperature changes, vibration, lighting conditions, weather cycles and other Site factors.

The Contractor shall furnish all materials required to provide adequate support for the cameras to be mounted at the selected vantage points. Materials include, but are not limited to, poles and mounting hardware. The Contractor shall furnish an independent source of power to the cameras as required.

The Contractor shall provide materials for production of two (2) master DVDs, in windows media format, of time-lapse videos at the end of the project documenting the construction of the subject Site from beginning-to-end. Time-lapses shall be professionally edited by a video editor using image stabilization software. The videos shall start with an image, incorporating the State Project Number, location, start and end dates of construction and the Department's logo. The videos shall be free of logos, copyrights, trademarks or any other identifying marks not previously indicated. Periods of bad weather or inactivity shall be removed to produce a compelling and consistent video. A machine edited video will not be accepted.

Eight (8) DVD copies of each finished time-lapse video and all captured still photos saved to a storage device shall be prepared and submitted to the Department. Deliverables are to be provided as a condition of Final Acceptance. The completed videos and the storage device with all captured still photos shall become the property of the Department and shall be free of all copyrights and other restrictions.

Construction Methods:

The Contractor shall submit product specifications of the cameras to be used to the Department for approval prior to start of construction.

Two vantage points shall be selected and approved by the Engineer from which to take photos for the videos. One vantage point shall provide a view of one of the GRS-IBS abutments and the

other shall provide an overview of the entire structure and work area. The locations shall be identified by the Contractor and approved by the Department. The locations shall be chosen such that the shadow effect on the work zone and normal construction activities, including but not limited to crane picks, will not obscure the photos. The locations shall not be such, as to produce backlighting that affects the quality of the photos. The Contractor may secure the camera on a nearby structure or furnish and install a fixed pole in accordance with the camera supplier's recommendations. Before construction begins, the Contractor shall set up the cameras at the locations selected and take a series of test images representing lighting conditions for an entire day. The images shall be submitted to the Department for approval of the quality of images as well as for approval of the vantage points. No work shall begin until the images and vantage points are approved.

The Contractor shall provide all service and maintenance, including cleaning of the camera systems, throughout the duration of the project and shall make appropriate arrangements for the cameras to remain in operation through the completion of construction. The Engineer will determine when the operation is complete. The Contractor shall ensure the camera lenses are free of dust, water, etc. that may obstruct the photos being taken at all times. The Contractor shall ensure that no equipment or materials are placed in such a way as to obstruct the view of the cameras.

12-megapixel, or greater, still photos shall be taken every 15 minutes from each camera while the Contractor is making progress. The photos shall be compiled to create two separate high-definition (1080p) time-lapse videos limited to a maximum of 3 minutes each in duration. One time-lapse video shall be of the construction of one of the GRS-IBS abutments and the other of the entire structure and work area.

Before making the specified number of DVD copies of the edited video, one copy of each edited video shall be submitted to the Engineer for acceptance. Upon acceptance of the master copies, additional DVD copies may be produced and submitted.

Method of Measurement:

This work will be paid for on a lump sum basis and will not be measured for payment.

Basis of Payment:

This work will be paid for at the Contract lump sum price for "Video Documentation (Site No. 1)," complete and accepted, which price shall include all materials, equipment and labor incidental to the creation and editing of two time-lapse videos, specified number of copies of each video, and all still photos saved to a storage device. All equipment required for safe and secure access to the camera locations for installation and maintenance services shall be included.

<u>Pay Item</u>	<u>Pay unit</u>
Video Documentation (Site No. 1)	L.S.

ITEM #0707009A – MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)

Description: Work under this item consists of furnishing and installing a seamless elastomeric waterproofing membrane system applied to a concrete or steel surface as shown on the plans, in accordance with this specification and as directed by the Engineer. Work shall also include conditioning of the surface to be coated and all quality-control testing noted herein.

The completed membrane system shall be comprised of a primer coat followed by the membrane coating which is applied in one or two layers for a minimum total thickness of 80 mil (2 mm). This work shall also include an additional 40 mil (1mm) membrane layer with aggregate broadcast into the material while still wet.

Materials: The membrane waterproofing system shall be one of the following:

1. Eliminator
 Manufacturer: Stirling Lloyd Products, Inc.
 152 Rockwell Road, Building A
 Newington, CT 06111
 860-666-5008
2. Bridge Deck Membrane System
 Manufacturer: Bridge Preservation, LLC
 87 Shawnee Ave.
 Kansas City, Kansas 66105
 913-321-9006

The membrane system shall meet the following requirements:

1. Primer: The primer shall be a 100% reactive, acrylic based, two component, spray applied resin capable of full cure in 40 minutes at 68°F (20°C).
2. Membrane: The membrane shall be 100% solvent free reactive, acrylic based, two component, spray applied material.
3. Aggregate: The aggregate shall be a nonfriable, durable #8 aggregate stone.

The membrane shall meet or exceed the following performance requirements:

PERFORMANCE REQUIREMENT	TEST METHOD	UNITS
Water Vapor Transmission	ASTM E96	0.3 Perms or less
Adhesion (Concrete)	ASTM D4541	150 psi (1.0 MPa) or failure in concrete
Adhesion (Steel)	ASTM D4541	300 psi (2.1 MPa)
Minimum Tensile Strength	ASTM D638, Method A, Die C	940 psi (6.4 MPa)
Minimum Elongation at Break	ASTM D638, Method A, Die C	80%
Crack Bridging	ASTM 1305	Pass @ 10 cycles, 0.125 inch (3.2mm) -15°F (-26°C)
Resistance to Heat Aging	ASTM C1522	Pass

Test Reports: The Contractor shall submit to the Engineer Notarized Test Reports showing conformance with the identified Performance Requirements listed in this specification in tests done no longer than 5 years prior to the anticipated installation date.

Materials Certificate: The Contractor shall submit to the Engineer a Materials Certificate for the primer and membrane in accordance with the requirements of Article 1.06.07.

Construction Methods: At least ten days prior to installation of the membrane system, the Contractor shall submit to the Engineer, the manufacturer's recommended procedure for preparing the deck surface, pre-treatment or preparing at cracks and gaps, treatment at curbs, vertical surfaces or discontinuities, applying the primer and membrane, and placing of aggregated coat. Procedures shall also include recommended repairs of system non-compliant issues identified during application. The system shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

A technical representative, in the direct employ of the manufacturer, shall be present on-site immediately prior to and during application of the membrane. The representative shall inspect and approve the surface prior to priming, and provide guidance on the handling, mixing and addition of components and observe application of the primer and membrane. The representative shall perform all required quality-control testing and remain on the Project site until the membrane has fully cured.

All quality-control testing, including verbal direction or observations on the day of the installation, shall be recorded and submitted to the Engineer for inclusion in the Project's records. A submittal of the quality-control testing data shall be received by project personnel prior to any paving over the finished membrane or within 24 hours following completion of any staged portion of the work.

1. **Applicator Approval:** The Contractor's membrane Applicator shall be fully trained and licensed by the membrane manufacturer and shall have successfully completed at least three spray membrane projects in the past five years. The Contractor shall furnish references from those projects, including names of contact persons and the names, addresses and phone numbers of persons who supervised the projects. This information shall be submitted to the Engineer prior to the start of construction. The Engineer shall have sole authority to determine the adequacy and compliance of the submitted information. Inadequate proof of ability to perform the work will be grounds to reject proposed applicators.

2. **Job Conditions:**

- (a) **Environmental Requirements:** Air and substrate temperatures shall be between 32°F (0°C) and 104°F (40°C) providing the substrate is above the dew point. Outside of this range, the Manufacturer shall be consulted.

The Applicator shall be provided with adequate disposal facilities for non hazardous waste generated during installation of the membrane system. The applicator shall follow safety instructions regarding respirators and safety equipment.

- (b) **Safety Requirements:** All open flames and spark producing equipment shall be removed from the work area prior to commencement of application.

"No Smoking" signs shall be visibly posted at the job site during application of the membrane waterproofing.

Personnel not involved in membrane application shall be kept out of the work area.

3. **Delivery, Storage and Handling:**

- (a) **Packaging and Shipping:** All components of the membrane system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the products type and batch number.
 - (b) **Storage and Protection:** The Applicator shall be provided with a storage area for all components. The area shall be cool, dry and out of direct sunlight and shall be in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

Copies of Material Safety Data Sheets (MSDS) for all components shall be kept on site for review by the Engineer or other personnel.

- (c) Shelf Life - Membrane Components: Packaging of all membrane components shall include a shelf life date sealed by the Manufacturer. No membrane components whose shelf life has expired shall be used.

4. Surface Preparation:

- (a) Protection: The Applicator shall be responsible for the protection of equipment and adjacent areas from over spray or other contamination. Parapets and bridge joints shall be masked prior to application of the materials.
- (b) Surface Preparation: All concrete components to receive membrane waterproofing shall have cured for a minimum of seven days in accordance with Section 6.01.03. Sharp peaks and discontinuities shall be ground smooth.

Surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae, growth, laitance, friable matter, dirt, bituminous products, and previous waterproofing materials. If required, degreasing shall be done by detergent washing in accordance with ASTM D4258.

The surface shall be abrasively cleaned, in accordance with ASTM D4259, to provide a sound substrate free from laitance.

The surface profile of the prepared substrate is not to exceed 1/4 inch (6 mm) (peak to valley) and areas of minor surface deterioration of 1/2 inch (13 mm) and greater in depth shall also be repaired. The extent and location of the surface patches require the approval of the Engineer before the membrane system is applied.

Voids, honeycombed areas, and blow holes on vertical surfaces shall be repaired in the same manner.

All steel components to receive membrane waterproofing shall be blast cleaned in accordance with SSPC SP6 and coated with the membrane waterproofing system within the same work shift.

- 5. Inspection and Testing: Prior to priming of the surface, the Engineer, Applicator and Manufacturer's technical representative shall inspect and approve the prepared substrate.
 - (a) Random tests for deck moisture content shall be conducted on the substrate by the Applicator at the job site using a "Sovereign Portable Electronic Moisture Master Meter," a "Tramex CMEXpertII Concrete Moisture Meter" or approved equal. The minimum frequency shall be one test per 1000 s.f. (100 sq.m) but not less than three tests per day per bridge. Additional tests may be required if atmospheric conditions change and retest of the substrate moisture content is warranted.

The membrane system shall not be installed on substrate with a moisture content greater than that recommended by the system's manufacturer, but shall not be greater than 6%, whichever is less.

- (b) Random tests for adequate tensile bond strength shall be conducted on the substrate using an adhesion tester in accordance with the requirements of ASTM D4541. The minimum frequency shall be one test per 5,000 s.f. (500 sq.m) but not less than three adhesion tests per bridge.

Adequate surface preparation will be indicated by tensile bond strengths of primer to the substrate greater than or equal to 150 psi (1.0 MPa) or failure in a concrete surface and greater than or equal to 300 psi (2.1 MPa) for steel surfaces.

If the tensile bond strength is lower than the minimum specified, the Engineer may request additional substrate preparation. Any primer not adequately applied shall be removed and a new primer applied at the Contractor's expense, as directed by Engineer.

- (c) Cracks and grouted joints shall be treated in accordance with the Manufacturer's recommendations, as approved or directed by the Engineer.

6. Application:

- (a) The System shall be applied in four distinct steps as follows:
 - 1) Substrate preparation and gap/joint bridging preparation
 - 2) Priming
 - 3) Membrane application
 - 4) Membrane with aggregate
- (b) Immediately prior to the application of any components of the System, the surface shall be dry (see Section 5a of this specification) and any remaining dust or loose particles shall be removed using clean, dry oil-free compressed air or industrial vacuum.
- (c) Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the membrane system may be continued up the vertical, as shown on the plans or as directed by the Engineer.
- (d) The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results, in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer.
- (e) A neat finish with well defined boundaries and straight edges shall be provided by the Applicator.

- (f) **Primer:** The primer shall consist of one coat with an overall coverage rate of 125 to 175 s.f./gal (3.0 to 4.3sq.m/1) unless otherwise recommended in the manufacturer's written instructions.

All components shall be measured and mixed in accordance with the Manufacturer's recommendations.

The primer shall be spray applied using a single component spray system approved for use by the Manufacturer. If required by site conditions and allowed by the manufacturer, brush or roller application will be allowed.

The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the Manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

Porous concrete (brick) may require a second coat of primer should the first coat be absorbed.

- (g) **Membrane:** The waterproofing membrane shall consist of one or two coats for a total dry film thickness of 80 mils (2 mm). If applied in two coats, the second coat shall be of a contrasting color to aid in quality assurance and inspection.

The membrane shall be comprised of Components A and B and a hardener powder which is to be added to Component B in accordance with the Manufacturer's recommendations.

The substrate shall be coated in a methodical manner.

Thickness checks: For each layer, checks for wet film thickness using a gauge pin or standard comb-type thickness gauge shall be carried out typically once every 100 s.f. (9 sq.m). Where rapid set time of the membrane does not allow for wet film thickness checks, ultrasonic testing (steel surfaces only), calibrated point-penetrating (destructive) testing, in-situ sampling (cutout of small sections for measuring thicknesses), or other methods approved by the Engineer shall be employed for determination of dry film thickness. The measured thickness of each and every individual test of the membrane shall be greater than or equal to the required thickness.

Bond Strength: Random tests for adequate tensile bond strength shall be conducted on the membrane in accordance with the requirements of ASTM D4541. The minimum test frequency shall be one test per 5,000 s.f. (500 sq.m) but no less than three adhesion tests per bridge. Adequate adhesion will be indicated by tensile bond strengths of the membrane to the substrate of greater than or equal to 150 psi (0.7 MPa) or failure in a concrete surface and greater than or equal to 300 psi (2.1 MPa) for steel surfaces.

Spark Testing: Following application of the membrane, test for pin holes in the cured membrane system over the entire application area in accordance with ASTM D4787-“Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.” Conduct the test at voltages recommended by the manufacturer to prevent damage to the membrane.

Repair the membrane system following destructive testing and correct any deficiencies in the membrane system or substrate noted during quality-control testing in accordance with the manufacturer’s recommendations to the satisfaction of the Engineer at no additional cost to the State.

- (h) Repairs: If an area is left untreated or the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the system. The damaged areas shall be cut back to sound materials and wiped with solvent (e.g. acetone) up to a width of at least four inches (100 mm) on the periphery, removing any contaminants unless otherwise recommended by the manufacturer. The substrate shall be primed as necessary, followed by the membrane. A continuous layer shall be obtained over the substrate with a four inches (100 mm) overlap onto existing membrane.

Where the membrane is to be joined to existing cured material, the new application shall overlap the existing by at least four inches (100 mm). Cleaning and surface preparation on areas to be lapped shall be as recommended in the manufacturer’s written instructions.

- (i) Aggregated Finish:
 - 1) Apply an additional 40 mil (1 mm) thick layer of the membrane material immediately followed by an aggregate coating, before the membrane cures, at a rate to fully cover the exposed area. The membrane and aggregate shall be fully integrated after the aggregate has been applied and the membrane cured.
 - 2) Localized areas not fully coated shall be touched-up with additional membrane and aggregate as needed.
 - 3) Remove loose and excess aggregate from the surface to the satisfaction of the Engineer and dispose of properly after application prior to allowing traffic onto finished surface or application of tack coat.
- (j) Tack Coat:

Prior to application of a bituminous concrete overlay, the aggregated finish shall be coated with tack coat in accordance with Section 4.06.

- 7. Final Review: The Engineer and the Applicator shall jointly review the area(s) over which the completed System has been installed. Any irregularities or other items that do not meet the requirements of the Engineer shall be addressed at this time.

Method of Measurement: The quantity to be paid for under this item shall be the number of square yards (square meters) of waterproofed surface completed and accepted.

Basis of Payment: This item will be paid for at the contract unit price per square yard (square meter) of “Membrane Waterproofing (Cold Liquid Elastomeric),” complete in place, which price shall include all surface preparation, furnishing, storing and applying the system, technical representative and quality control tests, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental to this work.

<u>Pay Item</u>	<u>Pay Unit</u>
Membrane Waterproofing (Cold Liquid Elastomeric)	s.y. (sq.m)

ITEM #0712021A – GRS ABUTMENT AND WINGWALL

ITEM #0712022A – ABUTMENT AND WINGWALL CMU WALL FACE

ITEM #0712024A – REINFORCED INTEGRATED APPROACH

DESCRIPTION:

This work consists of furnishing materials and constructing geosynthetic reinforced soil-integrated bridge system (GRS-IBS) abutments and wingwalls in the locations, grades, and to the dimensions and details shown on the plans, and in accordance with these Specifications.

Where called for on the plans or as ordered by the Engineer, this work shall also include furnishing and constructing a geosynthetic reinforced soil foundation (RSF).

The following are definitions of key elements in the GRS-IBS specification and details:

CMU: Concrete Masonry Units as defined in this specification and as shown on the plans.

CMU Height: The vertical dimension of the CMU measured from the bottom of the block to the top of the block.

CMU Width: The horizontal dimension of the CMU measured along the face of the wall or abutment. For CMU with irregular side surfaces or interlocking surfaces, the width is the center to center horizontal spacing measured parallel to the face of the wall.

CMU Thickness: The horizontal dimension measured perpendicular from the front face of the wall to the rear face of the CMU. For CMUs with irregular rear surfaces, the thickness is the distance to the furthestmost surface of the front side of the block.

CMU Abutment and Wingwall Wall Face: The portion of the system that comprises the CMU wall face elements.

Beam Seat Zone: The portion of the system that is directly below the beam seat that does not contain a concrete distribution slab. Beam Seat Zones are not required for bridges with distribution slabs cast on top of the GRS Abutment.

Bearing Bed Reinforcement Zone: The portion of the system that is directly below the Beam Seat or a concrete distribution slab,

Reinforced Integrated Approach: The portion of the system that is placed under the roadway approach pavement behind the rear face of the superstructure.

GRS Abutment and Wingwall: The portion of the system that makes up the reinforced soil mass of the system, including the No. 8 gradation crushed stone and the geotextile reinforcement.

GRS Foundation: The portion of the system that is below the reinforced soil mass of the GRS Abutment. It is used to properly seat the system on the substrate.

MATERIALS:

1. **Concrete Masonry Units (CMU):** CMU shall be precast-wet cast concrete blocks. Dry cast CMU will not be permitted. The CMU shall have facing texture and color(s) as specified on the plans. The CMU shall meet the requirements of Article M.03 of the Standard Specifications. The CMU shall have a minimum compressive strength of 4000psi (measured at 28 days). All CMU shall be air-entrained, composed of Portland cement, fine and coarse aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either air-entraining Portland cement or an approved air-entraining admixture. The entrained-air content shall be between 4% and 7%.

The CMU shall be the proprietary product 115/140 Retaining Blocks manufactured by:

REDI-SCAPES
05481 US 31 South
Charlevoix, Missouri 49720
(866) 222-8400

2. **GRS Abutment and Wingwall Backfill:** The material used in the Abutment Backfill shall meet the requirements of Article M.01.01 of the Standard Specifications, No. 8 Gradation.
3. **Reinforced Integrated Approach Backfill:** The material used for the Integrated Approach Backfill shall meet the requirements of Article M.05.01, Processed Aggregate Base.
4. **Geotextile:** The material shall be a biaxial, polypropylene geotextile. The Geotextile is required to have a minimum ultimate tensile strength of 4,800 lbs/ft and the reinforcement strength at 2% strain shall be greater than 1,100 lbs/ft, in accordance with ASTM 4595-11 or ASTM D 6637-11.

The geosynthetic reinforcement Manufacturer is responsible for establishing and maintaining a quality control (QC) program to ensure compliance with the requirements of these Specifications.

Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. Sampling and conformance testing shall be in accordance with ASTM D-4354, with conformance testing procedures established as noted in the specification. Geotextile product acceptance shall be based on ASTM D-4759.

The quality control certificate shall include roll number and identification, sampling procedures, and results of control test (including a description of test methods used).

5. **Portland Cement Concrete:** Concrete shall conform to the plans and meet the requirements of Section M.03 for Class “F” Concrete.
6. **Reinforcing:** Reinforcing shall be glass fiber reinforced polymer (GFRP) conforming to ACI 440.6, “Specification for Carbon and Glass Fiber-Reinforced Polymer Bar Materials for Concrete Reinforcement.” All GFRP reinforcement shall be deformed or sand coated.
7. **Fine Aggregate:** Fine Aggregate shall meet the requirements of Article M.03.01
8. **Mortar:** Mortar shall meet the requirements of Article M.11.04
9. **Grout:** Grout shall meet the requirements of Article M.03.05

SHOP DRAWINGS:

Preliminary Submissions: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a construction package, which shall include, but not be limited to the following:

- a. Plan sheets shall be 22” x 34”.
- b. Full plan view of each GRS abutment and wingwall drawn to scale. The plan view must illustrate the reinforcement lengths the Contractor plans on using for each lift height in accordance with the minimum lengths provided on the plans. Beginning and ending stations/offsets of each GRS abutment and wingwall, all utilities, signs, fence posts, etc. that are within the footprint of the reinforcement layers.
- c. Full elevation view of the GRS abutment and wingwall CMU wall face drawn to scale. Elevation views shall indicate the elevation at the top and bottom of the GRS abutments

and wingwalls including the top of the cast-in-place copings, horizontal and vertical control joints, and the location of finished grade.

- d. Typical cross sections drawn to scale including all appurtenances. Detailed cross sections shall be provided at significant reinforcement transitions.
- e. Material designations for all materials to be used.
- f. Detailed construction methods including a quality control plan, which shall cover the following:
 - i. Methods of delivery and placement of backfill materials including the proposed equipment. Accommodation of limited vertical and horizontal clearances and their impact on the equipment shall be addressed.
 - ii. Methods to control horizontal line and 0 degree batter of the front face of the wall including methods to adjust the line and batter as the wall layers are set. The methods shall account for the possibility of minor shifting of the CMUs during compaction of the backfill.
 - iii. Methods for making final grade adjustments at the top of the CMU wall face caused by the buildup of tolerances. (e.g. cast-in-place copings)
 - iv. Methods of accommodating stage construction joints. This may require the use of temporary wall sections that are left in place in the backfill material.
- g. Details of sloping top of GRS abutments and wingwalls where required.
- h. Details of corner treatments where required.
- i. Details of cast-in-place copings, where called for on the plans, including finished elevations, construction/contraction joints, reinforcement, and method of casting concrete against architectural treatments, where required.
- j. Details of Temporary Earth Retaining Systems where required.
- k. Details of wall treatment where the wall abuts other structures.

The preliminary submission shall be treated as a shop drawing in accordance with Section 1.05 amended as follows:

- a. 4 sets of each submission shall be supplied to the Department along with an electronic .pdf copy.
- b. The Contractor shall allow 21 days for the review of each submission. If subsequent submissions are required as a result of the review process, 21 days shall be allowed for review of each submission. No extensions in contract time will be allowed for the review of these submissions.

Final Submissions:

- a. Once a construction package has been reviewed and accepted by the Department, the Contractor shall submit the final plans electronically in .pdf form. The final submission shall also include two sets of full size (22" x 34") plans and four sets of half size (11" x 17") plans.
- b. The final submission shall be made within 14 days of acceptance by the Department. No work shall be performed on the GRS-IBS until the final submission has been received and accepted.
- c. Acceptance of the final design shall not relieve the Contractor of his responsibility under the contract for the successful completion of the work.

CONSTRUCTION METHODS:

1. **Pre-Installation Field Meeting:** A pre-installation field meeting will be scheduled by the Engineer and held prior to the start of any GRS-IBS and Geotechnical Instrumentation construction. The Engineer, Contractor, and all Subcontractors involved in the construction of the GRS-IBS and Geotechnical Instrumentation shall attend the meeting. Attendance is mandatory. The pre-installation field meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, to identify contractual relationships, and to delineate responsibilities amongst the Engineer, the Contractor and the various Subcontractors. The meeting will be held, after approval of the shop drawings, on a date to be determined by the Engineer.
2. **Excavation:** Excavation shall be accomplished and maintained in accordance with Article 2.03. Any backfilling of the excavation outside the limits of the GRS-IBS Abutment/Wingwalls and RSF shall be in accordance with Section 2.02.
3. **GRS Foundation:** The GRS Foundation shall consist of either: in-situ soil, Granular Fill, a concrete leveling pad or another foundation system as called for on the plans.

GRS Foundations placed on in-situ soil shall be prepared in conformance with Section 2.03.

GRS Foundations placed on Granular Fill shall be prepared in conformance with Section 2.13.

GRS Foundations placed on a concrete leveling pad shall be prepared in conformance with Section 3.03.

4. **GRS Abutment and Wingwalls:** The GRS Abutment and Wingwalls shall be constructed using compacted lifts with lift heights equal to the vertical spacing of reinforcement, as shown on the plans, or a nominal 6 inches, whichever is less. Compaction shall be performed using vibratory roller compaction equipment or other similar methods. A minimum of 4 passes will be required per lift. Within 3 feet of the front of the wall face, hand operated equipment such as lightweight mechanical tampers, plates or rollers shall be used to avoid damage or displacement of facing elements. The Engineer will visually inspect the lifts to confirm proper placement and compaction. All compaction equipment shall be selected to perform the appropriate compaction effort.

Geotextile reinforcement shall be installed in accordance with the manufacturer's recommendations and these Specifications and to the extent on the plans or as directed by the Engineer. The Geotextile shall be placed so that the strongest direction is perpendicular to the abutment facing and coverage shall be 100% of the embedment area unless otherwise shown on the plans. Adjacent sections of the Geotextile shall not be overlapped, except when exposed in the wrap-around facing system.

The Geotextile shall be laid so that it is taut and free of wrinkles prior to backfilling, and it shall extend between the layers of the CMU. The Geotextile shall cover a minimum of 85% of the top surface of the CMU. The Geotextile shall not extend out beyond any portion of the front face of the CMU. Any excess Geotextile shall be removed prior to placement of the next level of CMU. Overlaps of adjacent geosynthetic shall be trimmed where they are in contact with the surface of the CMU to avoid varying geosynthetic thicknesses between the CMU. Any seams in the geosynthetic shall be staggered with each successive layer of the GRS abutment. All seams between adjacent sheets of geosynthetic located in the area beneath the footprint of the bridge seat shall be perpendicular to the abutment wall face.

No equipment shall be placed on the geotextile until at least 6-inches of material has been placed, and tracked equipment shall use caution while turning on the backfill to avoid damaging the Geotextile.

5. **Abutment and Wingwall CMU Wall Face:** The first course of the CMU shall be set level and to grade. A thin leveling layer of Fine Aggregate, not more than 0.5 inches may be used on top of the prepared subgrade to facilitate construction of the first course of the CMU. If the leveling layer required exceeds 0.5 inches, a mortar or grout shall be place in the gap between the prepared subgrade and the first CMU course.

CMU construction shall begin at the lowest portion of the face with each layer placed horizontally, with the CMU placed tightly against the adjoining CMU without any gaps. The vertical GRS wall plumb shall be checked at least every other layer, and any deviations shall be corrected. Before placement of the backfill, every other row of CMU alignment shall be checked with a string line referenced off the back of the facing CMU from wall corner to corner. Each layer of CMUs shall be completely constructed and brushed cleaned of any debris and fill material prior to placing the next layer of reinforcement and CMU. CMU out of required alignment during construction shall be carefully moved back into position by methods that will not cause damage to other CMU or other work. Any damaged CMU shall be replaced to retain the new wall integrity.

Detail facing to account for wall batter and corners. Facing wall and wing wall courses shall be staggered to form a tight interlocking stable corner. Corner details shall be submitted to accommodate corners other than right angles. All cuts shall be performed to maintain the standard running or stretcher bond between the rows of the dry-stacked CMU, with the vertical joints of each course midway between those of adjoining courses.

A cast-in-place concrete coping, where called for, shall be formed and placed on the top course of the CMU wall facing. All GFRP bars in the same structural component shall be supplied by the same manufacturer; there shall be no mixing of products from different manufacturers in a component unless permitted in the contract drawings. Construction with GFRP bars shall conform to ACI 440.5, "Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars" and shall conform to Section 5 of the GFRP Guide.

Field cutting of GFRP will be permitted only with the approval of the Engineer. The field cutting shall be with a high speed cutter, fine blade saw, diamond blade or masonry saw. The GFRP bars shall not be shear cut. The ends of all field cut bars shall be treated per the manufacturer's recommendations.

All splices shall be in accordance with Connecticut Standard Specifications for Roads, Bridges and Incidental Construction Form 816 (2004) Section 6.02.03-5 and identical to the locations and arrangements shown on the plans.

Placing and fastening of all GFRP bars shall be in accordance with the Form 816 Section 6.02.03-4, except all GFRP bars supported on formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Reinforcing bars used as support bars shall be epoxy coated or galvanized. Chairs may be used for the purpose of maintaining proper distances from forms and must be either GFRP or

plastic. Tie wire for GFRP bars shall be soft annealed wire that has been nylon, epoxy, or plastic coated.

GFRP bars being handled by mechanical means shall be done by equipment having padded contact areas, or by the use of nylon webbing slings. The use of chains or wire rope slings shall not be allowed, even when used with padding. All bundles of bars shall be lifted in a manner to avoid bar-to-bar abrasion due to sagging. Support points during lifting or transporting bundles of GFRP bars shall be spaced at a maximum of 15 feet, or as required by the manufacturer, whichever is more restrictive. Bundled bars shall be strapped together with non-metallic or padded straps in a manner to prevent bar-to-bar abrasion due to relative movement between bars.

6. **Bearing Bed Reinforcement:** The Bearing Bed Reinforcement zone shall be compacted with a minimum of 6 passes per lift, with lift height equal to the vertical spacing of reinforcement, as shown on the plans, or 3 inches, whichever is less. Hand operated equipment such as lightweight mechanical tampers, plates or rollers shall be used within 3 feet of the wall face to avoid damage or displacement of facing elements. The Engineer will visually inspect the work to confirm proper placement and compaction.
7. **Superstructure Placement:** A crane used for placement of the superstructure can be positioned on the GRS abutment provided the outrigger pads are positioned within the capacity of the GRS mass. The outrigger pads shall be sized for 4,000 psf near the abutment face with greater loads able to be supported with increasing distance from the abutment face.

If the structure is set without a distribution slab, the structure shall be placed without dragging it across the beam seat surface to prevent an uneven bearing area or voids under the structure and uneven stresses.

8. **Reinforced Integrated Approach:** After placement of the superstructure, the Reinforced Integrated Approach shall be constructed. The Reinforced Integrated Approach shall consist of reinforced Processed Aggregate Base, placed and compacted per Section 3.04, with the exception of the lift dimensions.

The wrapped Geotextile reinforcement spacing shall be 12 inches, with intermediate Geotextile reinforcement layers spaced at 6 inches. The Processed Aggregate Base shall be placed and compacted in 6-inch lifts. The top wrap fold shall increase in length with each successive wrapped layer until the fill is 2 inches below the bridge grade. The top layer of Geotextile reinforcement shall be kept approximately 2 inches below the bituminous pavement.

9. **Site Drainage:** The GRS-IBS construction area shall be protected from surface runoff during the Project. The Site shall be graded at the end of the work shift in anticipation of precipitation to avoid saturation of soil. An alternative to grading by placing diversion trenches around the perimeter to divert water would be acceptable. Any loose soil placed to construct GRS shall be graded and compacted before stoppage of work for the day. Onsite stockpiles of fill material containing fines shall be protected from excess precipitation.
10. **Miscellaneous:** Where fencing, wood post or metal beam rail is called for within the limits of the reinforced soil mass, the posts shall be installed mechanically using a metal driving cap to puncture the layers of geotextile cleanly prior to post installation. Pre-formed concrete fence post foundations may be installed as the GRS-IBS is constructed. Wood posts shall not be driven through the geotextile to avoid negative effects to the reinforced soil mass. No holes shall be drilled through the geotextile at any stage of construction.

Where plantings are called for, they shall be installed outside the limits of the GRS-IBS soil mass to avoid root growth through the reinforced soil mass.

METHOD OF MEASUREMENT:

1. **GRS Abutment and Wingwall:** The GRS Abutment and Wingwall structures, including geotextile fabric, will be measured for payment by the cubic yards of No.8 Crushed Stone, including the Bearing Bed Reinforcement Zone, measured in place after compaction within the payment lines as shown on the plans or as specified by the Engineer. The measurement shall not include the volume of the CMU wall face elements as defined by the CMU length, width and thickness in this Specification. The Geotextile reinforcement is considered to be part of the GRS Abutment and Wingwall structures and will not be measured for payment.
2. **Abutment and Wingwall CMU Wall Face:** The CMU will be measured for payment by the number of square feet of wall face completed and accepted within the limits shown on the plans, measured by the actual horizontal and vertical dimensions of the wall face.
3. **Reinforced Integrated Approach:** The Reinforced Integrated Approach including geotextile fabric will be measured for payment by the cubic yards of Processed Aggregate Base measured in place after compaction within the payment lines as shown on the plans or as specified by the Engineer. The Geotextile reinforcement is considered to be part of the Reinforced Integrated Approach and will not be measured for payment.

BASIS OF PAYMENT:

1. **GRS Abutment and Wingwall:** “GRS Abutment and Wingwall” will be paid at the Contract unit price per cubic yard. Such payment shall include the cost of furnishing and installing No. 8 Crushed Stone, and Geotextile used within the backfill behind the CMU wall face and within the Bearing Bed Reinforcement Zone. Such payment also includes all labor, materials and equipment necessary to complete the work in an acceptable fashion.
2. **Abutment and Wingwall CMU Wall Face:** “Abutment and Wingwall CMU Wall Face” will be paid for at the Contract unit price per square foot. Such payment shall include the cost of furnishing and placing all CMUs, concrete used for the cast-in-place coping and filling the top three block courses, GFRP reinforcing, any Fine Aggregate, Mortar or Grout used to facilitate construction of the first course of the CMUs, all labor, materials, equipment, and incidentals necessary to complete the Abutment and Wingwall CMU Wall Face.
3. **Reinforced Integrated Approach:** “Reinforced Integrated Approach” will be paid at the Contract unit price per cubic yard. Such payment shall include the cost of furnishing and installing Processed Aggregate, Geotextile within the reinforced integrated approach, and all labor, materials and equipment necessary to complete the work in an acceptable fashion.

<u>Pay Items</u>	<u>Pay Units</u>
GRS Abutment and Wingwall	C.Y.
Abutment and Wingwall CMU Wall Face	S.F.
Reinforced Integrated Approach	C.Y.

ITEM #0714050A – TEMPORARY EARTH RETAINING SYSTEM

Description: Temporary earth retaining system shall be any type of adequately braced temporary retaining wall such as temporary sheet piling which the Contractor elects to build to satisfy, and which does satisfy, the condition that existing facilities be properly retained during excavation or fill for the placement of substructure or other facilities. Temporary earth retaining system shall be designed by the Contractor and constructed where shown on the plans. This system shall be removed upon completion of the permanent work, except that some sections may be left in place when so ordered by the Engineer.

Materials: Materials of steel sheet piling shall conform to the requirement of ASTM A 328. Timber sheet piling shall conform to the requirements of Subarticle M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended. Systems utilizing other material(s) shall conform to the manufacturer's specifications and project specifications. The parts list shall be furnished for the proprietary system and the Contractor shall provide the material certificates for the parts.

Construction Methods: Temporary earth retaining system shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for battered pile clearance when necessary. Movements of the system or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the temporary earth retaining system or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

Working drawings and design calculations for temporary earth retaining system shall be submitted in accordance with the requirements of Article 1.05.02(2). The working drawings and design calculations shall be prepared, sealed, and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the Contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

Unless otherwise ordered by the Engineer, all parts of the temporary earth retaining system shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of the system unless otherwise permitted by the Engineer. Temporary earth retaining system may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

Method of Measurement: Temporary earth retaining system will be measured for payment by the number of square feet of temporary retaining wall completed and accepted, as computed from the horizontal and vertical payment lines shown on the plans or as ordered. If no payment limits are shown on the plans, the limits used for payment will be the actual horizontal limit of temporary earth retaining system installed and accepted, and the vertical limit as measured from

the bottom of the exposed face of the wall system to the top of the retained earth behind the system. The measurement for temporary earth retaining system which is used as a common wall for staged construction will be the horizontal payment limit shown on the plans and the greater vertical dimension of the common wall face.

Basis of Payment: Payment for this work will be made at the contract unit price per square foot for "Temporary Earth Retaining System" measured as described above, which price shall include all design, materials, equipment and labor incidental to the construction and removal of the temporary earth retaining system required at the locations specified on the plans; including removal of obstructions, repair and correction, adjustments or reconstruction required by the plans. Any common earth retaining system required for staged construction will be measured for payment only once.

Pay Item	Pay Unit
Temporary Earth Retaining System	s.f.

ITEM #0728009A – 2” CRUSHED STONE

Description:

Work under this item shall consist of furnishing and installing crushed stone for the infiltration trench in the location and to the dimensions shown on the plans.

Materials:

Crushed stone shall be the product resulting from the artificial crushing of rocks, boulders or large cobblestones, substantially all faces of which have resulted from the crushing operation. Broken or crushed stone shall consist of sound, tough, durable stone, reasonably free from soft, thin, elongated, laminated, friable, micaceous or disintegrated pieces, mud, dirt or other deleterious material and shall be sized to meet the requirements of Article M.01.01 for No. 3 Crushed Stone.

Construction Methods:

2” crushed stone shall be placed in layers not over 6” in depth, with each layer thoroughly compacted before the addition of other layers.

Method of Measurement:

This work will be measured in place after compaction within the payment lines shown or specified by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per cubic yard for “2” Crushed Stone” complete in place, which shall include all materials, equipment, tools, and labor incidental thereto.

Excavation will be paid for as “Trench Excavation” in accordance with Article 2.05.05.

Pay Item

Pay Unit

2” Crushed Stone

C.Y.

ITEM #0822005A – TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)

Description: Work under this item shall consist of furnishing, installing, and removing temporary precast concrete barrier curb (typical 24” wide curbing) for use on structures as shown on the plans or as directed by the Engineer. This work shall also include the drilling, grouting, and later removal of anchor bolts, and the cleaning and subsequent grouting and sealing of anchor bolt holes after the barrier is removed.

Materials:

1. The barrier shall be precast concrete conforming to Article 8.21.02-1.
2. Manufacturer identification and casting date shall be permanently marked on each barrier unit by means of a non-corrosive metal or plastic tag in the location shown on the plan. When used barrier is furnished, the Contractor shall provide documentation stating from where the material came, what project it will be used on, the casting dates, and certification that the barrier conforms to all State requirements.
3. Reinforcing steel shall conform to the requirements of ASTM A615, Grade 60.
4. Lifting hooks, keys, bolts, devices and attachments shall be of the size indicated on the plans or of a design satisfactory for the purpose intended as approved by the Engineer.
5. Anchor bolts shall conform to ASTM A307. Heavy hex nuts shall conform to AASHTO M291. The plate washers shall conform to AASHTO M223, Grade 50. The anchor bolts, nuts, and plate washers shall be hot-dip galvanized in accordance with AASHTO M232 and M111 as applicable.
6. Loop bars shall be bent from smooth bar steel conforming to AISI 1018 (Hot-rolled). Ends shall be hot-dip galvanized in accordance with AASHTO M111.
7. Threaded connection rods shall be steel conforming to AASHTO M 314 (ASTM F1554) Grade 55. The rod shall be threaded for a minimum of 4 inches at each end. Plain steel washers shall be manufactured in accordance with ANSI B18.22. Heavy hex nuts shall conform to AASHTO M291 for Class 10S. The threaded

connection rods, washers, and nuts shall be hot-dip galvanized after fabrication in accordance with the requirements of Class C of AASHTO M232.

8. The chemical anchor material shall be a resin compound specially formulated to secure bolts in concrete against tension pull-out. The Contractor shall select the chemical anchor material in accordance with Article M.03.07.
9. Non-shrink grout shall conform to subarticle M.03.05.
10. Barrier shall be accepted on the basis of the manufacturer's certification, as defined in Article M.08.02-4.
11. Sealant for patching holes in bituminous overlays shall be a cold-applied bituminous sealer conforming to M.08.01-15.
12. Anchor Bolts/Threaded Connection Rods-Certified Test Reports: The Contractor shall submit a Certified Test Report and a Materials Certificate in conformance with Article 1.06.07 and a sample of all anchor bolts, threaded connection rods, nuts, and washers for testing prior to their installation. The Contractor shall not install any anchor bolts or threaded connection rods prior to receipt of the approved test results and approval by the Engineer.
13. Delineators shall conform to Article 8.22.02.

Construction Methods:

1. Fabrication: The barrier shall be precast concrete in conformance with the pertinent requirements of Article 8.21.03 and the plans, except that penetrating sealer protective compound is not required.
2. Installation: The barrier shall be placed as shown on the plans or as directed by the Engineer.

The barriers shall be anchored to the concrete deck slab in accordance with the plans and the following:

- a) **Prestressed Deck Units:** Threaded inserts with matching anchor bolts shall be used for securing the barrier to prestressed deck units. The threaded inserts shall be cast into the deck units during fabrication as necessary to accommodate stage construction.

- b) Chemical Anchoring: This consists of drilling holes in concrete deck slabs, placing anchor bolts in the holes, and securing the bolts with a pre-approved chemical anchor material.

The Contractor shall submit the following to the Engineer for approval: type of drill, diameter of bit, method of cleaning holes, and method of placement of chemical anchor material. Specifications and recommendations for the aforementioned may be obtained from the manufacturer of the chemical anchor material.

Drilling methods shall not cause spalling, cracking, or other damage to the concrete. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

Care shall be taken not to drill holes into or through structural steel.

The Contractor shall take the necessary precautions to prevent materials from falling onto the roadway below.

When reinforcing steel is encountered during the drilling of the holes, the Contractor shall attempt to angle the hole to bypass the bar. If this can not be accomplished, then the bar shall be drilled through.

The anchor bolts shall extend to the bottom of the holes and be hammer tapped to insure full penetration. The chemical anchor material shall be installed in accordance with the written directions supplied by the manufacturer of the chemical anchor material.

The barrier shall be anchored down by torquing the bolts "snug tight", which is defined as the tightness attained after several impacts from an impact wrench. No part of the bolt head shall project above the outer surface of the barrier.

- c) Through-Bolting: This consists of drilling completely through the deck slab and securing anchor bolts on the underside with plate washers and nuts. Through-Bolting is not permitted on new construction or prestressed concrete. Measures shall be taken to insure that no damage occurs to property below the bridge.

Care shall be taken not to drill holes into or through structural steel.

The barrier shall be anchored down by torquing the bolts “snug tight”, which is defined as the tightness attained after several impacts from an impact wrench. No part of the bolt head shall project above the outer surface of the barrier.

3. Connection of Barrier Units: The barrier shall be joined together with threaded connection rods, washers, and heavy hex nuts in accordance with the plans.
4. Cutting of Anchor Bolts: Where ordered by the Engineer, protruding anchor bolts shall be cut off flush with the surface of the concrete deck. The bolts shall then be ground down below the surface of the deck and the space filled in with non-shrink grout. At the Contractor’s option, the anchor bolts may be pre-coated with a material recommended by the chemical anchoring material’s manufacturer which will allow for complete removal of the anchor bolts.
5. Patching with Non-Shrink Grout: After removal of the barrier, holes in newly constructed concrete decks and threaded inserts shall be blown clean with an air jet and filled in with non-shrink grout. The non-shrink grout shall be mixed and placed in strict accordance with the manufacturer's directions. The non-shrink grout shall be finished flush with the deck surface. Allow grout to cure a minimum of 24 hours before placing sealant in any remaining hole in the bituminous wearing surface.
6. Delineators: Delineators shall be installed on top of the barrier in accordance with Article 8.22.03-3 and the plans.
7. General: The barrier shall be kept in good condition at all times by the Contractor during all stages of construction. Any damaged material shall be replaced by the Contractor at his expense.

When the barrier is no longer required, it shall be removed from the work site and become the property of the Contractor.

8. Relocation of Barrier: If called for on the plans, the Contractor shall relocate the barrier and its appurtenances to locations within the project limits as shown on the plans or as ordered by the Engineer.

Method of Measurement: Temporary structure barrier curbing will be measured for payment along the centerline at the top of the barrier and will be the actual number of feet of temporary structure barrier of the applicable size furnished, installed, and accepted.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for "Temporary Precast Concrete Barrier Curb (Structure)", complete in place, which price shall include all furnishing, transportation, initial installation, final removal, storage, materials, reinforcing steel, connection rods, and all equipment, tools, and labor incidental thereto. The cost of furnishing, installing, and cutting of anchor bolts shall also be included for payment under this item. Each temporary structure barrier will be paid for once regardless of the number of times it is used on the project. Any barrier units that become lost, damaged or defaced shall be replaced by the Contractor at no cost to the State.

Delineators will be paid for in accordance with Article 12.05.05.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Precast Concrete Barrier Curb (Structure)	L.F.

ITEM #0904987A – REMOVE AND RESET METAL BRIDGE RAIL

Description: Work under this item shall consist of removing, transporting, storing and reinstallation of metal bridge rail where indicated on the plans or as ordered by the Engineer.

Materials: Existing bridge rail, posts, base plates and all associated hardware is to be re-used. Material damaged during removal, transporting, storage or reinstallation shall be replaced in-kind at the Contractor's expense.

Construction Methods: The existing bridge rail, posts and base plates are to be carefully removed, stored in a secure location, and reinstalled as indicated on the plans. Anchor bolts, post to rail connections, rail splice connections and any associated hardware is also to be carefully removed, stored in a secure location, and reinstalled as indicated on the plans.

Railing shall not be cut during removal. Railing shall to be removed up to the existing splice connections.

Threaded inserts that are specified to remain in place on the plans shall not be damaged and shall remain in place. Threaded inserts for the new locations shall be paid for under the pay item "Class "F" Concrete".

Method of Measurement: Remove and Reset Metal Bridge Rail will be measured for payment by the number of feet of entire length of railing from the centerline of first post to the centerline of last post. No additional payment will be made for removal, storage, and reinstallation of railing outside of the limits of concrete barrier removal.

Basis of Payment: The work will be paid for at the contract unit price per foot, for "Remove and Reset Metal Bridge Rail" removed, stored and reinstalled, which price shall include all materials, equipment, tools and labor, incidental thereto.

Pay Item

Pay Unit

Remove and Reset Metal Bridge Rail

l.f.

ITEM #0917010A – REPAIR GUIDERAIL

Description: Work under this item shall consist of the repair of newly installed guiderail. It shall be repaired in the locations originally installed and fabricated in conformity with the lines, designations, dimensions, and details shown on the plans or as ordered by the Engineer.

Materials: The material for guiderail shall meet the requirements as specified within the original applicable contract items.

When repairing guiderail, the Contractor shall reuse any undamaged existing guiderail elements, timber rail, wire rope, appropriate posts, delineators, lap bolts, and other hardware within the project limits as approved by the Engineer to repair the guiderail. The Contractor shall use new materials when any components of the existing railing are damaged or missing and cannot be obtained from other guiderail systems being removed or converted within the Project limits.

Construction Methods: The repair of guiderail shall be in accordance with contraction methods as specified within the original applicable contract items.

Guiderail, including end anchors, which has been installed in final condition and accepted by the Engineer, shall be eligible for reimbursement for repairs subject to the conditions described below. If multiple runs are to be installed in a single stage as indicated in the contract documents, determination for reimbursement shall be made when all runs within the stage are complete and accepted as previously described. On projects without designated stages, guiderail installations must be complete and serving the intended function as determined by the Engineer.

When newly installed guiderail is damaged by public traffic, the following conditions must be satisfied prior to reimbursement for payment;

1. The damage must have been caused solely by the traveling public.
2. The contractor shall provide satisfactory evidence that such damage was caused by public traffic. Such as accident reports obtained from the Connecticut Department of Public Safety, police agencies or insurance companies; statements by reliable, unbiased eyewitnesses; or identification of the vehicle involved in the accident.
3. The contractor shall attempt to collect the costs from the person or persons responsible for the damage and provide documentation of those efforts to the satisfaction of the Engineer.
4. If such evidence cannot be obtained, the Engineer may determine that the damage was not caused by the Contractor and reimbursement for payment is warranted.

This repair provision does not relieve the Contractor of the requirements of Section 1.07, any other contractual requirements for maintenance and protection of traffic and final acceptance and relief of responsibility for the project.

The contractor shall remain responsible for the safety and integrity of the guiderail system for the duration of the project. In the event the guiderail is damaged, the Contractor shall provide sufficient cones, drums and other traffic control devices to provide safe passage by the public. When ordered by the Engineer, the Contractor shall furnish replacement parts and immediately repair the guiderail, but in no case more than 24 hours after notification from the Engineer. In non-emergency situations, the guiderail shall be repaired within 72 hours. The repaired guiderail or anchorages, when completed, shall conform to these specifications for a new system. The Contractor shall be responsible for the removal and the proper disposal of all damaged material and debris.

Method of Measurement: Guiderail damaged solely by the traveling public will be measured for payment. Damage caused by the Contractor's equipment or operations will not be measured for payment.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for repair of guiderail will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the contract.

Basis of Payment: Repair of guiderail will be paid for in accordance with Article 1.09.04 as required to restore the rail to its full working condition in conformance with these specifications for a new system. There will be no payment for maintenance and protection of traffic for work associated with this item unless, in the opinion of the Engineer, the sole purpose of the maintenance and protection of traffic is for repair of the guiderail.

Pay Item

Repair Guiderail

Pay Unit

est. (est.)

ITEM #0921019A – TEXTURED CONCRETE MEDIAN

Description:

Work under this item shall consist of textured (stamped), colored concrete surfaces constructed on gravel or reclaimed miscellaneous aggregate base with a thickness and stamped, colored concrete finish as shown on the plans or as directed by the Engineer, and in accordance with these specifications.

Materials:

Materials for this work shall conform to the requirements of Article 9.21.02 – Materials, for Concrete Sidewalk, amended as follows:

Add the following:

1. **Reinforcement** – The welded wire fabric, where required, shall be W1.4 X W1.4 and shall conform to the requirements of Article M.06.01.
2. **Coloring Agent** – The primary concrete coloring agent shall be pigmented coloring admixtures processed specifically for incorporating into the concrete mix and complying with ASTM C979. If the concrete mix is not delivered with the coloring admixture already mixed in, pre-weighed and packaged dry high-grade coloring pigments for integrally colored concrete shall be used. The pigment color to be added to the concrete shall be selected as shown on the plans or as directed by the engineer from manufacturer's standards. A colored release agent compatible with the integral pigments shall be used in accordance with the manufacturer's recommendations to achieve the desired finished appearance.
3. **Color and Pattern** –

Color:

Chromix Admixture Color No. C-32 (Quarry Red), manufactured by L.M. Scofield Company, 280 Park Avenue, Rutherford, NJ 07070, (201) 672-9050, OR

QC Colortech Color No. 5MRO-D5D3-U9J5 (Georgia Brick), manufactured by QC Construction Products, P.O. Box 599, Madera, CA 93639, (800) 453-8213, OR

Davis Colors #160 (Brick Red), manufactured by Specco Industries, Inc., 13087 Main Street, Lemont, Illinois 60439, (630) 257-5060, OR

Approved equal.

Pattern:

“Used Brick – Running Bond” pattern from Scofield LITHOTEX® Pavecrafters® pattern sheets, by L.M. Scofield Company, 280 Park Avenue, Rutherford, NJ 07070, (201) 672-9050, OR

“Running Bond Belgian Block” from Bomacron Tools Pattern Selection Guide, by The Bomanite Company, CONNECTICUT BOMANITE SYSTEMS INC., 17A Trowbridge Drive Bethel, CT 06801, 203-778-5719, OR

“Running Bond Brick” pattern from Stampcrete International, Ltd., 325 Commerce Blvd. Liverpool, New York 13088, (315) 451-2837 OR

Approved equal.

4. **Releasing Agent** – A dry-shake powder releasing agent shall be used to facilitate release of imprinting tools as recommended by the manufacturer.
5. **Mat Tools** – Mat tools shall be high quality resilient mats reproduced from castings of natural materials and providing uniform control of joint depth. The stamped concrete pattern shall be chosen to represent the appearance as shown on the plans or as directed by the Engineer.
6. **Sealant** – A clear sealant shall be applied as recommended by the manufacturer.
7. **Isolation Joint Material** – Joint material shall be one-half (1/2) inch in thickness, equal in width to the slab thickness and conform to AASHTO M33-93, Asphaltic Expansion Joint Materials.

The surface sealant shall meet the following standards:

ASTM C-67 Section 7, Section 10 (water absorption & efflorescence)

ASTM - 67 Section 9 (suction)

ASTM – C-666, 23-69 (freeze thaw resistance, artificial weathering, salt attack resistance)

The sealer shall be a clear liquid that will not affect the color of the concrete and provided as a one-time permanent application.

Cement from the same mill and raw materials of the same type and brand should be used for all the stamped concrete surfaces on the project including the test panel to minimize the potential for color variations. In addition, the temperature of the concrete must be kept between 65 and 85 degrees Fahrenheit unless otherwise specified by the manufacturer.

Construction Methods: The contractor for this work shall have a minimum of 5 years of experience performing the installation of patterned, colored concrete on various state and/or municipal contracts. The prime Contractor shall submit a minimum of 5 references that can verify the satisfactory completion of similar work performed by the concrete contractor within 7

calendar days of the award of the contract for the approval by the Engineer. The references submitted shall include the names, addresses, and phone numbers of the personnel responsible for the administration of the contracts, and the addresses and/or locations of a representative installation overseen by each reference. If the Engineer determines that the contractor proposed for this work has had insufficient experience, or has performed unsatisfactory work on other contracts, the Contractor will be required to submit the above documentation for an alternate contractor for the Engineer's approval.

At least 30 days prior to construction of the first stamped concrete surfaces, the Contractor shall prepare a test form with a full scale field mock-up of the stamped concrete surface (5'x5') showing the proposed color, stamp pattern, joint treatment and layout as shown on the plans. The test panel shall include a repaired area of at least 1.5' X 1.5' to demonstrate the Contractors ability to match the color and texture in the event the stamped concrete becomes damaged during construction and requires repair. Additional test panels ordered by the Engineer for purposes of color comparison only, may be 1.5' X 1.5'. The Contractor may choose to supply several test panels of this size for purposes of color selection prior to construction the stamped 5' X 5' textured panel. If the resulting appearance is not acceptable to the Engineer, adjustments shall be made to the color, pattern, finished texture and/or joint treatment and another test form shall be prepared for inspection. The construction of the stamped concrete shall not begin until the Engineer has approved the test panel. The test panels shall be maintained during construction in an undisturbed condition as a standard for judging the completed work. All test panels shall be removed and disposed of when directed by the Engineer.

The pattern layout and joint locations shall be coordinated with and approved by the Engineer prior to any construction. The stamped concrete shall have a uniform and consistent color and pattern matching that of the approved test panel. Care is required while constructing the pattern with respect to the joints to ensure the bricks in the pattern line up with the joint locations. All manufacturers' recommendations shall be followed unless otherwise directed by the Engineer.

Isolation Joints shall be installed wherever concrete is placed against already installed concrete or stone structures such a curbing, building, or other, previously existing paving.

Welded wire fabric reinforcement shall be used in all textured concrete used as sidewalk buffer treatments, as shown on the plans. Welded Wire Fabric for concrete reinforcement shall be embedded at mid depth in the slab. Reinforcement will not be required in textured concrete used in median islands.

Prior to any pouring of concrete, all sign post locations within pour area shall be staked out in accordance with the requirements of the applicable provisions of Item #980001A – Construction Staking and approved by the engineer. A PVC sleeve shall be installed at each sign post location proposed within the textured concrete. The sleeve shall be large enough to permit the installation of the required sign post through the sleeve. In no case shall the textured concrete median be poured directly around a sign post already installed without the use of a sleeve or an alternate spacer approved by the Engineer.

Excavation, construction of gravel or reclaimed miscellaneous aggregate base, constructing forms, and the placement of concrete shall be performed in accordance with the requirements of the applicable provisions of Article 9.21.03 – Construction Methods.

The concrete slab shall be placed on the prepared subbase to the depth and width as shown on the plans. The concrete shall be screeded to the finished grade and floated to a uniform surface using standard finishing techniques.

Low Temperature Placements: No concrete is to be placed when air temperature is below 50°F unless additional precautions are taken and prior approval is given by the Engineer. The Engineer must approve all placements below 50°F. No concrete will be placed on frozen subgrade or at temperatures below 20°F. Concrete exposed to temperatures below 40°F after placement must be protected through the use of insulating blankets, a six (6) inch layer of straw that is maintained in a dry condition by a covering of plastic sheeting, or other appropriate methods. Any concrete placed during cold weather that is damaged because of freezing shall be replaced at the Contractor's own expense.

A releasing agent shall be applied evenly to the surface. While the concrete is still in the plastic stage of set, the specified imprinting tools shall be applied to the surface in order to develop the desired patterned surface as indicated on the plans or specified by the Engineer. Once the concrete slab has reached initial cure, the releasing agent may be washed off with a normal garden hose. It is usually desirable to leave a certain amount of releasing agent in the imprint lines and textured areas to give a two-color effect, which is most desirable in stamped concrete surfaces.

The surface shall be cleaned of dirt, oil, gas and all other foreign material and allowed to dry completely before applying sealer per manufacturer's recommendations.

The Contractor shall have on the job, at all times, sufficient waterproof paper to provide complete coverage in the event of rain. Protect the surface if rain occurs before final set. If rain falls on the newly coated sidewalk before the curing film has dried sufficiently to resist damage, or if the film is damaged in any other manner, the contractor shall reapply same. Treated surfaces shall be protected from all foot or vehicular traffic for a sufficient period of time to prevent damage.

The Contractor shall protect newly poured concrete surfaces so as to prevent damage from falling objects, vandalism, etc. The Contractor shall repair or remove and replace any damaged or defaced concrete surface at his own expense. Determination to repair or remove and replace will be at the sole discretion of the Engineer.

Method of Measurement: *Method of Measurement for this work will conform to the requirements of Article 9.21.04 – Method of Measurement, for Concrete Sidewalks, amended as follows:*

There will be no measurement for payment for coloring agent, releasing agent, mat tools, reinforcement or sealer, but the cost shall be considered as included in the price bid for the Textured Concrete Median.

Test panels shall be included in the general cost of the work and will not measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per square foot for “Textured Concrete Median,” complete in place, which price shall include all excavation, gravel or reclaimed miscellaneous aggregate base, backfill, disposal of surplus material, PVC sleeves, joint material, welded wire fabric reinforcement, and all equipment, tools, materials and labor incidental thereto. The price shall also include concrete complete in place including coloring agent/color hardener, releasing agent, mat tools, or sealer and construction and proper disposal of test panels.

<u>Pay Item</u>	<u>Pay Unit</u>
Textured Concrete Median	SF

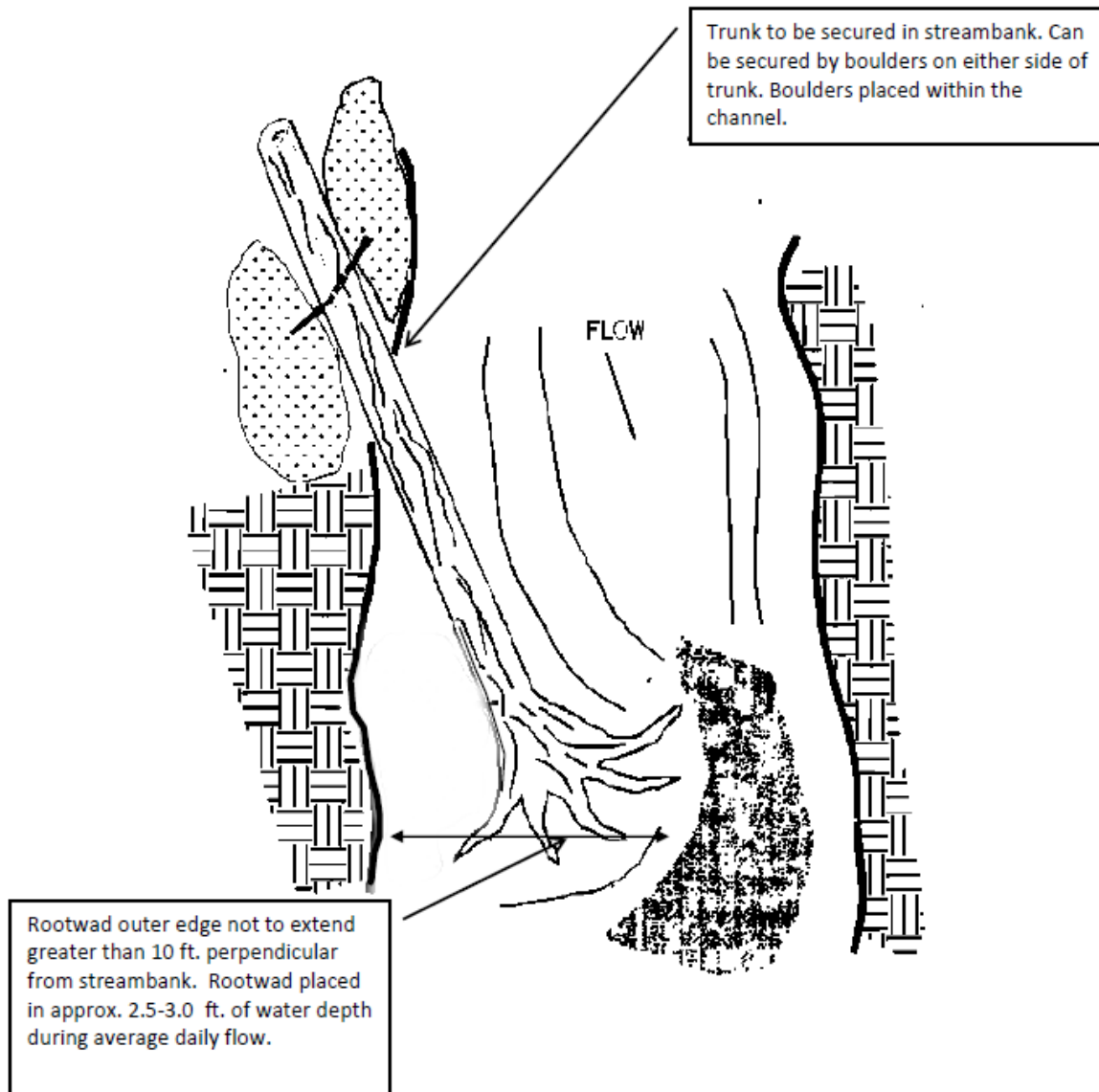
ITEM #0948429A – ROOT WADS

Description: The work shall consist of furnishing, transporting and installing root wads, boulders, fill material, topsoil and footer logs as a means to provide limited bank stabilization and aquatic habitat enhancement.

Materials: An Environmental Scientist from the Connecticut Department of Transportation's Office of Environmental Planning (OEP) shall be notified a minimum of 2 weeks in advance to inspect and approve the root wads and boulder material for placement along the streambank. The root wads must be native material free of invasive plant species, decay and branches.

Root wads can be selected from clearing and grubbing operations under Section 2.01, or obtained from an offsite source if necessary.

1. Root wad. The root wad stem shall be a minimum of 12 feet in length with a root crown attached and shall have a minimum stem diameter of 12 inches. The root crown shall be a minimum of 5 feet in diameter. Bracing boulders or bracing log may be required on top of the root wad if bank height is low.
2. Footer Log. For watercourses with a low gradient, the root wad shall be anchored to a footer log. The footer log shall have a diameter equivalent to the diameter of the root wad stem. The footer log length will be determined based on the number of root wads required at one location. At minimum, the footer log length shall be equivalent to the length of a single root wad. If multiple root wads are required at one location, the root wads shall be anchored 5 feet on center. If the footer log is to be trenched excavated at or below stream invert, the footer log should have a minimum diameter of 24 inches.
3. Boulder. For watercourses with a high gradient, the root wad shall be anchored to a set of boulders. Boulders shall have a minimum diameter of 2 feet. If a back eddy is formed because of the root wad, a bracing boulder shall be placed downstream of the root wad. The bracing boulder diameter shall be 2 times larger than the root wad stem diameter.
4. Brace Log. A brace log should have a diameter equivalent to that of the root wad.
5. Fill Material. Back fill excavated area behind the footer logs, root wads or boulders with a combination of gravel and riprap material.
6. Topsoil. A minimum of 4 inches to topsoil will be required to back fill the excavated area to achieve final grade. Permanently stabilize area with ConnDOT approved seed mix. Stock piled material or material obtained from an offsite source must be free of invasive species.
7. Rebar. #6 rebar with a minimum length of 5 feet shall be used. If a bracing log is required, the minimum #6 rebar length shall be 6 feet.



Construction Methods: Installation shall be done during low flow conditions in accordance with the permit plates, environmental permit plans, construction plans and under the direction by OEP or an OEP approved representative. Use equipment and placement techniques that will minimize disturbance within the watercourse. Preventative measures such as erosion and sedimentation controls, dewatering basins or water handling devices may be required to perform root wad installation in the dry.

Notify OEP at least 10 days prior to initiating the placement of root wad materials. Any and all coordination with the Department of Energy and Environmental Protection (DEEP) Inland Fisheries Division personnel must be done through the OEP.

Work should proceed from the downstream section to the upstream end of the reach or meander beginning with the excavation of the toe trench to a depth of one-half to two-thirds the diameter of the footer logs or boulders. Trenches should also be excavated for root wad placement. The center of the root crown should be set approximately 1/3 the bankfull height in order to provide toe protection.

Footer logs or boulders should be positioned in the trench below the stream invert such that each upstream log is shingled over its downstream neighbor at least 2 times the diameter of the root wad stem.

In cut sections, root wads should be positioned in trenches such that the root crown sits level with the cut end of the stump. An angle of 30 to 60 degrees upstream into the channel center line is usually adequate. Subsequent root wads should be spaced such that the bank is shielded from flows deflected by adjacent upstream root wads.

A rebar may be required to anchor the bracing log, root wad and footer log. The rebar should be inserted through a drilled hole by manual means or by an electric pneumatic jack hammer.

The root wad and associated materials should be backfilled to the specified grade and fill material should be tightly packed in joints, connections and gaps to firmly secure all components. Larger material should be used to plug holes and gaps to keep fill from falling into the channel.

Equipment: When placing and maneuvering rocks within the channel or embedding rocks into the bank, the Contractor shall use an excavator with an articulated bucket (with thumb). Any other equipment proposed to be used shall be reviewed and approved in advance by OEP or an approved representative.

Method of Measurement: This work will be measured for payment at the contract lump sum, which shall include furnishing all components of the root wads, installed and accepted.

Basis of Payment: This work will be paid for at the contract lump sum price for "Root Wads", which price shall include all root wad materials, equipment, tools, labor, excavation, fill material, erosion control measures, water handling devices, seed mix and work incidental thereto. Full payment shall not be made until the area has been accepted by the Environmental Scientists.

Pay Item	Pay Unit
Root Wads	LS

ITEM #0952051A – CONTROL AND REMOVAL OF INVASIVE VEGETATION

Description: This work shall include all materials, labor and equipment necessary for the identification, eradication, removal, and disposal of unwanted vegetation in locations either indicated on the plan sheets or as directed by an Environmental Scientist from the Connecticut Department of Transportation's Office of Environmental Planning (OEP). While any and all invasive species, including those listed on the website for the Connecticut Invasive Plant Working Group's (CIPWG) Invasive Plants Council (<http://www.hort.uconn.edu/cipwg/IPC.html>), may be subject to eradication at the direction of the Environmental Scientist, the following species must always be eradicated: tree-of-heaven (*Ailanthus altissima*), Russian and autumn olive (*Elaeagnus angustifolia* and *E. umbellata*), smooth buckthorn (*Rhamnus cathartica*) and glossy buckthorn (*Frangula alnus*), multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), winged euonymus (*Euonymus alata*), shrub honeysuckles (*Lonicera maackii*, *L. morrowii*, *L. tartarica*, *L. X bella*, *L. xylosteum*), privet (*Ligustrum obtusifolium*, *L. ovalifolium*, *L. sinense*, *L. vulgare*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese knotweed (*Polygonum cuspidatum*), common reed (*Phragmites australis*), and reed canary grass (*Phalaris arundinacea*). If project-specific invasive species additional to those listed above need to be removed, the Environmental Scientist will give appropriate direction.

All vegetation designated for removal shall be eradicated in its entirety in accordance with the methods submitted by the Contractor and approved by the Environmental Scientist. Some work will be completed within areas where desirable species are present and will remain. The Contractor will be responsible for protection of desirable species that are to remain.

Materials: Mechanical removal shall consist of either manual labor, utilizing a weed wrench or other approved machine, or some other approved method that will enable removal of all root pieces and other parts of the target species while minimizing soil disturbance and avoiding any spread of invasive plant material. Where large infestations of invasive/unwanted vegetation are present and identified on the plans, removal via over-excavation of such vegetation and the underlying soils may be required

All herbicides shall be registered for the species being treated and shall be formulated as applicable for target-species foliar treatment, cut surface, or injection applications. Where work in or immediately adjacent to wetlands is necessary, the product label(s) for any chemical/adjuvant formulation applied must indicate that the formulation is approved for aquatic environments.

Construction Methods: The Contractor shall have sole responsibility for identifying all invasive species present within the invasive removal areas called out in the contract documents prior to the Pre-Construction Meeting. The Contractor shall submit the required invasive removal plan at the Pre-Construction Meeting for the review and approval of the Environmental Scientist. This plan shall include a list of all invasive species present on site, along with a schedule of operations and an outline of construction methodologies for the required control and removal of invasive vegetation specific to each species listed.

While the Environmental Scientist will review the Contractor's delineation and removal plan, the Contractor must be competent to identify invasive vegetation at all times of the year and to prepare a plan for its eradication without assistance.

During the Pre-Construction Meeting, a field review shall be scheduled so that the Contractor and the Environmental Scientist can review the areas of invasive species removal, the specific species required to be removed, and the Contractor's submitted invasive species control plan. At this time, the Environmental Scientist may designate areas for removal that are additional to those shown on the plans. If changes are required to the originally submitted plan, these changes must be submitted to the Environmental Scientist at least 10 days prior to beginning work.

Upon receiving a Notice to Proceed, the Contractor will delineate all areas designated for invasive species removal. The Contractor will be responsible for maintaining this delineation throughout the life of the contract.

The Contractor will not be allowed to begin construction activities in the designated removal areas until all schedules, outlines, and methodologies are approved in writing by the Environmental Scientist. This schedule must take into consideration the time period required between herbicide application and the physical removal of the target species wherever such removal is to occur. No removal work can occur for a minimum of two weeks after herbicide application. In all cases, the submitted schedule shall consider mechanical methods for removal before proposing herbicide application.

The schedule and outline shall include:

- 1) The type(s) of invasive species identified in the designated area(s);
- 2) Species specific treatment methods describing a full course of treatment for each species to achieve eradication. These methods must show:
 - a. Removal methods planned (e.g. pulling, cutting, spraying, etc);
 - b. Types and concentrations of any herbicides to be used, including any adjuvants; and
 - c. Schedules showing dates and types of initial, intermediate and final treatments;
- 3) Any construction activities planned in designated removal area(s) during the eradication period;
- 4) Disposal methods, including:
 - a. Onsite methods and locations; and
 - b. Requests for off-site disposal locations;
- 5) Proof of DEP licensure for herbicide application;
- 6) A description of safety equipment required; and
- 7) Procedures for handling chemical spills.

The Contractor shall also:

- a. Maintain the labels for herbicides being used in his/her possession;
- b. Provide OEP with a 10 day work notice prior to proceeding so that the Environmental Scientist can schedule to be present when appropriate;
- c. Conduct all herbicide formulations and applications, including the addition of appropriate surfactants and other adjuvants, in strict conformance with the manufacturer's recommendation and per requirements of regulatory agencies; and
- d. Maintain a written record of herbicide application, including the formulation, concentration, area treated, and date for each application, to be provided by the commercial applicator and submitted to the Environmental Scientist following each treatment.

A "treatment period" for each designated area will be derived from the schedule submitted by the

Contractor and determined by the following:

- 1) The first treatment date of the earliest treatable vegetation; and
- 2) The last treatment date of the latest treatable vegetation

It is anticipated that many species will require more than one season to obtain complete eradication. The treatment period must take into consideration those species that will require follow up treatments and more than one season for complete eradication. Upon completion of the treatment period, the Contractor shall notify the Environmental Scientist in writing of the status of eradication. If the eradication has not been successful, the Contractor shall also submit additional treatment plans. If the Contractor believes that eradication has been achieved, the Contractor shall request a site inspection by the Environmental Scientist for concurrence. If the Environmental Scientist concurs that eradication has been achieved, the area will be subject to a one (1) year warranty starting on the first day following the inspection by the Environmental Scientist. During this period the Contractor will be responsible for any further occurrences of the invasive species inside the delineated area.

The Contractor will be responsible for removal and eradication of all plant material deemed as invasive or unwanted within the delineated area(s) for the duration of the project or until relieved of responsibility of the removal item, and the delineation shall remain in place until this time.

Flush cut brush and trees shall not be more than 2 inches (50mm) above the ground line. Flush cutting shall be performed in a controlled manner that will prevent the spread of parts or seeds of invasive species. Brush hogging or any other clearing method that may promote the spread of invasive plant material is also not permissible.

Broadcast or uncontrolled spray application will not be permitted, and care must be taken to avoid contacting non-target species and/or deterring the recolonization of native species following application.

Remove all twining vines in treetops to the greatest extent possible without damaging the branches of the supporting desired vegetation. Cut and remove vines overtopping tree canopies. Climbing spikes will not be permitted for aerial work.

Prune out any branches on non-treatment plants that are damaged during removal of vegetation. All corrective pruning shall conform to the National Arborists Association Pruning Standards.

The site must be monitored by the Contractor and any new or regrowth treated prior to beginning installation of any landscape plantings.

Processing and disposal of unwanted vegetation shall be done in a controlled manner so as not to spread invasive seed or plant parts within the surrounding areas. All cut invasive vegetation shall be separated from clearing and grubbing operations and all other cleared material. Invasive plant materials may be buried on site within the Department ROW provided that they are under a minimum of 10 feet (3.0 m) of cover on all sides for Japanese knotweed and phragmites and 3 feet (1 m) of cover on all sides for all other species and/or removed from the site and disposed of at the approved location(s) identified in the Contractor's submitted schedule and outline of construction methodologies.

No equipment or vehicles other than that required to complete the work will be permitted in the areas designated for invasive vegetation removal. Any equipment used to process invasive materials, such as chippers and transport vehicles, must be cleaned prior to further use. Processing equipment must also be cleaned prior to further transport.

Wherever removal operations result in exposed soils, disturbed areas must be vegetatively stabilized with the appropriate seed mix and protected with hay, cellulos fiber mulch, or erosion control matting. The application rate for hay mulch and fiber mulch shall be 3500 lbs per acre (3920 kg/hectare).

Method of Measurement: The control and removal of invasive vegetation will be measured by the number of square yards (square meters) of invasive and unwanted vegetation identified and eradicated as required above, including any required re-treatment of any regrowth or new growth. The area for removal will be delineated prior to treatment and measured for payment. After a review of the delineated areas, the Environmental Scientist may designate additional areas for removal that are not shown on the plans. These additional areas will be delineated, measured for payment, and included as part of the contract work.

Where selective removal is required, the drip line of the invasive vegetation will be measured for payment and shall include larger trees.

Basis of Payment: This work will be paid for at the contract unit price per square yard (square meter) for "Control and Removal of Invasive Vegetation". This payment shall include all labor, materials, tools, and equipment necessary for delineation of the invasive area(s); maintenance of the delineation throughout the project; species identification; and cutting, treating, re-treating, removal, and on or off-site disposal of designated invasive plant material. Off-site disposal of residue shall include the loading, transport, dumping, and fees associated with legal off-site disposal.

- Upon approval of the required schedules, the Contractor will receive a payment equal to 10% of all areas delineated.
- Upon initial treatment as it is described in the schedule of operations, the Contractor will receive a payment equal to 30% of all areas receiving initial treatment.
- Upon successful completion of the treatment period as determined during the site review by the Environmental Scientist, the Contractor will receive a payment equal to 30% of all areas receiving final treatment.
- Upon successful completion of the 1 year warranty period covering all treated areas on the project, the contractor will receive a payment equal to 30% of the areas treated.

Where excavation is required for removal, this work shall be covered under the contract Item "Earth Excavation". All other vegetation removed shall be included in the Item "Clearing and Grubbing" in accordance with Section 2.01.

Vegetative stabilization of disturbed areas shall be paid for under the respective contract Items: "Turf Establishment".

Pay Item
Control and Removal of Invasive Vegetation

Pay Unit
S.Y. (S.M.)

ITEM #0969062A – CONSTRUCTION FIELD OFFICE, MEDIUM

Description: Under the item included in the bid document, adequate weatherproof office quarters shall be provided by the Contractor for the duration of the work, and if required for a maximum of 90 days thereafter, at the discretion of the Engineer, for the exclusive use of CTDOT forces and others who may be engaged to augment CTDOT forces with relation to the Contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02. This office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

Materials: Materials shall be in like new condition for the purpose intended and shall be approved by the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below.

Description \ Office Size	Small	Med.	Large	Extra Large
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	400	400	1000	2000
Minimum number of exterior entrances.	2	2	2	2
Minimum number of parking spaces.	7	7	10	15

Office layout: The office shall have a minimum square footage as indicated in the table above, and shall be partitioned as shown on the building floor plan as provided by the Engineer.

Tie-downs and skirting: Modular offices shall be tied-down and fully skirted to ground level.

Lavatory Facilities: For field offices sizes Small and Medium the Contractor shall furnish a toilet facility at a location convenient to the field office for use by Department personnel and such assistants as they may engage; and for field offices sizes Large and Extra Large the Contractor shall furnish two (2) separate lavatories with toilet (men and women), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. Each lavatory shall have hot and cold running water and flush-type toilets. For all facilities the Contractor shall supply lavatory and sanitary supplies as required.

Windows and Entrances: The windows shall be of a type that will open and close conveniently, shall be sufficient in number and size to provide adequate light and ventilation, and shall be fitted with locking devices, blinds and screens. The entrances shall be secure, screened, and fitted with a lock for which four keys shall be furnished. All keys to the construction field office shall be furnished to the Department and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes, with appropriate handrails. Stairways shall be ADA/IBA compliant and have non-skid tread surfaces. An ADA/ABA compliant ramp with non-skid surface shall be provided with the Extra-Large field office.

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

Additional Equipment, Facilities and Services: The Contractor shall provide at the field Office at least the following to the satisfaction of the Engineer:

Parking Facility: The Contractor shall provide a parking area, adjacent to the field office, of sufficient size to accommodate the number of vehicles indicated in the table above. If a paved parking area is not readily available, the Contractor shall construct a parking area and driveway consisting of a minimum of 6 inches of processed aggregate base graded to drain. The base material will be extended to the office entrance.

Field Office Security: Physical Barrier Devices - This shall consist of physical means to prevent entry, such as: 1) All windows shall be barred or security screens installed; 2) All field office doors shall be equipped with dead bolt locks and regular day operated door locks; and 3) Other devices as directed by the Engineer to suit existing conditions.

Electric Service: The field office shall be equipped with an electric service panel to serve the electrical requirements of the field office, including: lighting, general outlets, computer outlets, calculators etc., and meet the following minimum specifications:

- A. 120/240 volt, 1 phase, 3 wire.
- B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
- C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
- D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each computer workstation location.
- E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
- F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
- G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
- H. After work is complete and prior to energizing, the State's CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
- I. Prior to field office removal the CTDOT Data Communications office must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68°-80° Fahrenheit within the field office.

The following furnishings and equipment shall be provided in the applicable field office type:

Description \ Office Size	Qty.			
	Small	Med.	Large	Extra Large
Office desk (2.5 ft x 5 ft) with drawers, locks, and matching desk chair that have pneumatic seat height adjustment and dual wheel casters on the base.	1	3	5	8
Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.	-	-	-	1
Personal computer tables (4 ft x 2.5 ft).	2	3	5	8
Drafting type tables (3 ft x 6 ft) and supported by wall brackets and legs; and matching drafters stool that have pneumatic seat height adjustment, seat back and dual wheel casters on the base.	1	1	1	2
Conference table, 3 ft x 12 ft.	-	-	-	1
Table – 3 ft x 6 ft.	-	-	-	1
Office Chairs.	2	4	8	20
Mail slot bin – legal size.	-	-	1	1
Non-fire resistant cabinet .	-	-	2	4
Fire resistant cabinet (legal size/4 drawer), locking.	1	1	2	3
Storage racks to hold 3 ft x 5 ft display charts.	-	-	1	2
Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack.	1	1	2	2
Double door supply cabinet with 4 shelves and a lock – 6 ft x 4 ft.	-	-	1	2
Open bookcase – 3 shelves – 3 ft long.	-	-	2	2
White Dry-Erase Board, 36” x 48”min. with markers and eraser.	1	1	1	1
Interior partitions – 6 ft x 6 ft, soundproof type, portable and freestanding.	-	-	6	6
Coat rack with 20 coat capacity.	-	-	-	1
Wastebaskets - 30 gal., including plastic waste bags.	1	1	1	2
Wastebaskets - 5 gal., including plastic waste bags.	1	3	6	10
Electric wall clock.	-	-	-	2
Telephone.	1	1	1	-

Description \ Office Size	Qty.			
	Small	Med.	Large	Extra Large
Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.	-	-	-	1
Mini refrigerator - 3.2 c.f. min.	1	1	1	1
Hot and cold water dispensing unit. Disposable cups and bottled water shall be supplied by the Contractor for the duration of the project.	1	1	1	1
Microwave, 1.2 c.f. , 1000W min.	1	1	1	1
Fire extinguishers - provide and install type and *number to meet applicable State and local codes for size of office indicated, including a fire extinguisher suitable for use on a computer terminal fire.	*	*	*	*
Electric pencil sharpeners.	1	2	2	2
Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.	1	1	2	4
Laser Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Hardware and Software</u> . All supplies, paper and maintenance shall be provided by the Contractor.	1	1	1	1
Computer System as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.	2	3	5	8
Digital Camera as specified below under <u>Computer Hardware and Software</u> . All supplies and maintenance shall be provided by the Contractor.	1	1	3	3
Video Projector as specified below under <u>Computer Hardware and Software</u> .	-	-	-	1
Smart Board as specified below under <u>Computer Hardware and Software</u> .	-	-	-	1
Infrared Thermometer, including third party certified calibration, case, and cleaning wipes.	1	1	1	2
Rain Gauge.	1	1	1	1
Concrete Curing Box as specified below under Concrete Testing Equipment.	1	1	1	1
Concrete Air Meter as specified below under Concrete Testing Equipment as specified below. Contractor shall provide third party calibration on a quarterly basis.	1	1	1	1
Concrete Slump Cone as specified below under Concrete Testing Equipment.	1	1	1	1

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Telephone Service: For a Small, Medium and Large field office this shall consist of the installation of two (2) telephone lines: one (1) line for phone/voice service and one (1) line dedicated for the facsimile machine. For an Extra-Large field office this shall consist of four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for facsimile machine. The Contractor shall pay all charges except for out-of-state toll calls made by State personnel.

Data Communications Facility Wiring: Contractor shall install a Category 5e 468B patch panel in a central wiring location and Cat 5e cable from the patch panel to each PC station, terminating in a (category 5e 468B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the CTDOT Data Center staff in coordination with the designated field office personnel as soon as the facility is in place. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

For a Small, Medium and Large field office the Contractor shall run a CAT 5e LAN cable a minimum length of 25 feet for each computer to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. For an Extra-Large field office the Contractor shall run CAT 5e LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each computer location. Terminate runs to patch panel in LAN switch area. Each run / jack shall be clearly labeled with an identifying Jack Number.

The installation of a data communication circuit between the field office and the CTDOT Data Communication Center in Newington will be coordinated between the CTDOT District staff, CTDOT Office of Information Systems and the local phone company. The CTDOT District staff will coordinate the installation of the data communication service with CTDOT PC Support once the field office phone number is issued. The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer as soon as possible to facilitate data line and computer installations.

Computer Hardware and Software: Laser Copier/Scanner/Fax, Computer Systems, Digital Camera(s) and Smart Board shall comply with the posted requirements at Departments web site www.ct.gov/dot DOING BUSINEES WITH CTDOT > Contractor Resources > Computer Hardware and Software.

Before ordering the computer hardware and software, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications for review by the CTDOT Data Center. Computer hardware and software proposed at a minimum must comply with requirements in place 30 days before submission.

Before any equipment is delivered to the Data Center, arrangements must be made at least one business day in advance by contacting person or unit name? 860-594-3500. All software, hardware and licenses provided shall be clearly labeled, specifying the (1) Project No., (2) Contractor Name, (3) Project Engineer's Name and (4) Project Engineer's Phone No., and shall be delivered to the CTDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with CTDOT field personnel and the computer system specified will be stationed in the Department's Project field office.

The computer system furnished shall have all software and hardware necessary for the complete installation of the latest versions of the software listed, and therefore supplements the minimum specifications below. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability, the compatibility with current agency systems, and to provide the Department with a computer system that can handle the needs of the Project. This requirement is to ensure that the rapid changing environment that computer systems have experienced does not leave the needs of the Project orphan to what has been specified. There will not be any price adjustment due to the change in the minimum system requirements.

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by each software producer for the duration of the Contract. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals. The Contractor shall provide original backup media for the software.

The Contractor shall provide the computer system with all required supplies, maintenance and repairs (including labor and parts) throughout the Contract life.

Once the Contract has been completed, the computer will remain the property of the Contractor. Prior to the return of any computer(s) to the Contractor, field personnel will coordinate with the Data Center personnel for the removal of Department owned equipment, software, data, and associated equipment.

A) Computer – Minimum Specification (Revised 3-1-15):

- Processor – Intel® Core i5 Processor (3.20 GHz, 1600 MHz FSB 6MB Cache)
- Memory – 8 GB DDR3 1600MHz.
- Monitor – Dual (2) 24.0 inch LCD color monitors.
- Graphics – Intel Integrated Graphics.
- Hard Drive – 500 GB 7200 RPM SATA or equivalent (Western Digital, IBM or Seagate).
- Optical Drive – CD-RW/DVD-RW.
- Multi-Card Reader – Must include SD
- Multimedia Package – Integrated Sound and speakers.
- Case – Small Form or Mid Tower, capable of vertical or horizontal orientation.
- Integrated Network Adapter

Keyboard – 104+ Keyboard.

Mouse – Optical 2-button mouse with scroll wheel.

Operating System – Windows 7 Professional 64-Bit Service Pack 1

Application Software – MS Office 2010 Professional Edition (or newer).

Additional Software (Latest Releases, including subscription services for the life of the Contract.–

- Symantec Endpoint Protection
- CD/DVD burning software (ROXIO or NERO)
- Blue-Beam **Revu eXtreme** (*Must be original purchased Licensed Media CD/DVD or authentic digital down load certificate*).
 - Adobe Acrobat Professional may be specified as an alternative to Blue-beam Revu eXtreme, upon request by administrating District (*Must be original purchased Licensed Media CD/DVD or authentic digital down load certificate*)

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so the computer can be restored to original prior to shipment back to the contractor.

Uninterrupted power supply – APC Back-UPS 500VA.

Note A1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows 7 Professional, Microsoft Office 2010 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell (preferred) and HP (acceptable) brands only. No other brands will be accepted. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

B) Laser Printer – Minimum Specification:

Contact CTDOT Department of Technology Services (1-860-594-3500) for the current approved printer list.

Note B1: Laser printer brands are limited to Hewlett-Packard and Savin brands only. The CTDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note B2: It is acceptable to substitute a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the required laser printer and fax machine.

C) Digital Camera – Minimum Specification:

Optical – 5 megapixel, with 3x optical zoom.

Memory – 2 GB.

Features – Date/time stamp feature.

Connectivity – memory card reader.

Software – Must be compatible with Windows 7.

Power – Rechargeable battery and charger.

D) Smart Board or Video Projector (only applicable for Extra –large Office):

Contact CTDOT Office of Construction (1-860-594-2658) for the current approved smart board or Video Projector specifications.

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then a replacement must be provided. All supplies, paper and maintenance for the computers, laptops, printers, copiers, and fax machines shall be provided by the Contractor.

Concrete Testing Equipment: If the Contract includes items that require compressive strength cylinders for concrete, in accordance with the Schedule of Minimum Testing Requirements for Sampling Materials for Test, the Contractor shall provide the following. All testing equipment will remain the property of the Contractor at the completion of the project.

- A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.
- B) Air Meter – The air meter provided shall be in good working order and meet the requirements of AASHTO T 152.
- C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of five thousand dollars (\$5,000) in order to insure all State-owned data equipment and supplies used in the office against all losses. The Contractor shall be named insured on that policy, and the Department shall be an additional named insured on the policy. These losses shall include, but not be limited to: theft, fire, and physical damage. The Department will be responsible for all maintenance costs of Department owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Department equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Department may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the Contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should exceed the required amount of the insurance coverage, the Department will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Department, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the

office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

Method of Measurement: The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, rounded up? to the nearest month.

There will not be any price adjustment due to any change in the minimum computer hardware and software requirements.

Basis of Payment: The furnishing and maintenance of the construction field office will be paid for at the Contract unit price per month for “Construction Field Office, (Type),” which price shall include all material, equipment, labor, utility services and work incidental thereto.

The cost of providing the parking area, external illumination, trash removal and snow and ice removal shall be included in the monthly unit price bid for the respective item “Construction Field Office, (Type).”

The State will be responsible for payment of data communication user fees and for toll calls by State personnel.

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Field Office, (Type)	Month

ITEM #0970006A – TRAFFICPERSON (MUNICIPAL POLICE OFFICER)
ITEM #0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)

9.70.01—Description: Under this item the Contractor shall provide the services of Trafficpersons of the type and number, and for such periods, as the Engineer approves for the control and direction of vehicular traffic and pedestrians. Traffic persons requested solely for the contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters)). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Trafficpersons shall consist of the following types:

1. Uniformed Law Enforcement Personnel: Law enforcement personnel shall wear the high visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated for the Uniformed Flaggers' garment.

Law Enforcement Personnel may be also be used to conduct motor vehicle enforcement operations in and around work areas as directed and approved by the Engineer.

Municipal Police Officers: Uniformed Municipal Police Officers shall be sworn Municipal Police Officers or Uniformed Constables who perform criminal law enforcement duties from the Municipality in which the project is located. Their services will also include an official Municipal Police vehicle when requested by the Engineer. Uniformed Municipal Police Officers will be used on non-limited access highways. If Uniformed Municipal Police Officers are unavailable, other Trafficpersons may be used when authorized in writing by the Engineer. Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

2. Uniformed Flagger: Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

9.70.04—Method of Measurement: Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

9.70.05—Basis of Payment: Trafficpersons will be paid in accordance with the schedule described herein.

There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

1. Uniformed Law Enforcement Personnel: The sum of money shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount for the contract.

The Department will pay the Contractor its actual costs for "Trafficperson (Municipal Police Officer)" plus an additional 5% as reimbursement for the Contractor's administrative expense in connection with the services provided.

The invoice must include a breakdown of each officer's actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the municipality. Upon receipt of the invoice from the municipality, the Contractor shall forward a copy to the Engineer. The invoice will be reviewed and approved by the Engineer prior to any payments. *Eighty (80%) of the invoice will be paid upon completion of review and approval. The balance (20%) will be paid upon receipt of cancelled check or receipted invoice, as proof of payment.* The rate charged by the municipality for use of a uniformed municipal police officer and/or a municipal police vehicle shall not be greater than the rate it normally charges others for similar services.

2. Uniformed Flagger: Uniformed flaggers will be paid for at the contract unit price per hour for "Trafficperson (Uniformed Flagger)", which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

Pay Item	Pay Unit
Trafficperson (Municipal Police Officer)	est.
Trafficperson (Uniformed Flagger)	Hr.

ITEM #0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Route I-84

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protect a minimum of two lanes of traffic, each lane on a paved travel path not less than 12 feet in width.

The Contractor shall be allowed to halt traffic for a period of time not to exceed 10 minutes for the purpose of erecting, removing, and setting structural steel and for the removal of the existing bridge superstructure, as approved by the Engineer. If more than one 10-minute period is required, the Contractor shall allow all stored vehicles to proceed through the work area prior to the next stoppage.

Route I-84 Ramps

The Contractor shall maintain and protect existing traffic operations.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protect a minimum of one lane of traffic, on a paved travel path not less than 12 feet in width.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. This additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

The Contractor will be allowed to close the I-84 Eastbound Exit 63 on and off-ramps to through traffic and detour traffic as shown on the Detour Plans contained in the contract plans for the purpose of installing bridge girders, removing the existing bridge, and paving activities.

All Other Roadways

The Contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

Where turn lanes exist, the Contractor shall provide an additional 10 feet of paved travel path to be used for turning vehicles only. This additional 10 feet of travel path shall be a minimum length of 150 feet. It shall be implemented so that sufficient storage, taper length, and turning radius are provided.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night), or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3-foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the workday, if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary traversable slope of 4:1 or flatter that is acceptable to the Engineer.

If applicable, when an existing sign is removed, it shall be either relocated or replaced by a new sign during the same working day.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

Construction vehicles entering travel lanes at speeds less than the posted speed are interfering with traffic, and shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at posted speeds, in order to merge with existing traffic.

Existing Signing

The Contractor shall maintain all existing overhead and side-mounted signs throughout the project limits during the duration of the project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary, and install temporary sign supports if necessary and as directed by the Engineer.

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the Department including the offices of Maintenance and Traffic, and the Town/City to determine what interim traffic control measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

Pavement Markings - Limited Access Highways, Turning Roadways and Ramps

During construction, the Contractor shall maintain all pavement markings throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include lane lines (broken lines), shoulder edge lines, stop bars, lane-use arrows and gore markings, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. All painted pavement markings will be paid under the appropriate items.

If the Contractor does not install permanent Epoxy Resin Pavement Markings by the end of the work day/night on exit ramps where the final course of bituminous concrete pavement has been installed, the Contractor shall install temporary 12 inch wide white stop bars. The temporary stop bars shall consist of Temporary Plastic Pavement Marking Tape and shall be installed by the end of the work day/night. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of these markings when the permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

Pavement Markings -Non-Limited Access Multilane Roadways

Secondary and Local Roadways

During construction, the Contractor shall maintain all pavement markings on paved surfaces on all roadways throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include centerlines, shoulder edge lines, lane lines (broken lines), lane-use arrows, and stop bars, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. If the next course of bituminous concrete pavement will be placed within seven days, shoulder edge lines are not required. The painted pavement markings will be paid under the appropriate items.

If the Contractor will install another course of bituminous concrete pavement within 24 hours, the Contractor may install Temporary Plastic Pavement Marking Tape in place of the painted pavement markings by the end of the work day/night. These temporary pavement markings shall include centerlines, lane lines (broken lines) and stop bars; shoulder edge lines are not required. Centerlines shall consist of two 4 inch wide yellow markings, 2 feet in length, side by side, 4 to 6 inches apart, at 40-foot intervals. No passing zones should be posted with signs in those areas where the final centerlines have not been established on two-way roadways. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of the Temporary Plastic Pavement Marking Tape when another course of bituminous concrete pavement is installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for the safe and efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

- Speed and volume of traffic
- Duration of operation
- Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

Signs must be placed in such a position to allow motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads), where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

- 1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.
- 1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:
 - Review Project scope of work and time
 - Review Section 1.08, Prosecution and Progress
 - Review Section 9.70, Trafficpersons
 - Review Section 9.71, Maintenance and Protection of Traffic
 - Review Contractor's schedule and method of operations.
 - Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
 - Open discussion of work zone questions and issues

- Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

- 2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.
- 2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.
- 2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.
- 2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

- 3.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.
- 3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advanced warning signs.
- 3.c) Stopping traffic may be allowed:
 - As per the contract for such activities as blasting, steel erection, etc.
 - During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
 - To move slow moving equipment across live traffic lanes into the work area.
- 3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning

signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 4c and traffic shall be allowed to resume their normal travel.

- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.
- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travelpath prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.
- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.
- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

- 4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).
- 4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.
- 4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.
- 4.d) The Flashing Arrow board display shall be in the “arrow” mode for lane closure tapers and in the “caution” mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the “caution” mode when it is positioned in the closed lane.

- 4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

- 5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.
- 5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.
- 5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the “flashing arrow” mode when taking the lane. The sign truck and workers should be immediately ahead of the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the “caution” mode when traveling in the closed lane.
- 5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the “caution” mode when in the closed lane.
- 5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled “Type ‘D’ Portable Impact Attenuation System”. Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.
- 5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for “Type ‘D’ Portable Impact Attenuation System”. When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for “High Mounted Internally Illuminated Flashing Arrow”. If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a “Type ‘D’ Portable Impact Attenuation System” for the hours used to install and remove the pattern, typically 2

hours (1 hour to install and 1 hour to remove), and is also paid for the day as a “High Mounted Internally Illuminated Flashing Arrow”.

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

- 6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.
- 6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.
- 6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.
- 6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

- 7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.
- 7.b) CMS should not be installed within 1000 feet of an existing CMS.
- 7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.
- 7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.
- 7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.

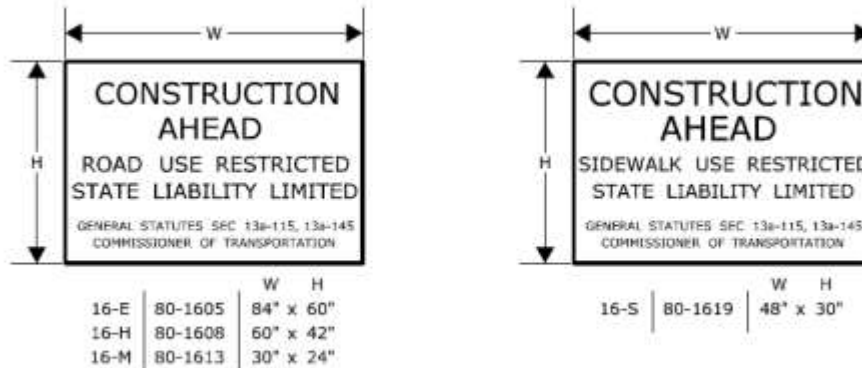
- 7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).
- 7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).
- 7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.
- 7.i) The messages that are allowed on the CMS are as follows:

<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION

8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION
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For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

SERIES 16 SIGNS



THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMP PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMP, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

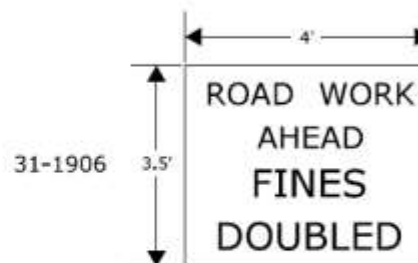
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED SIGNS

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
2012.06.05 11:35:43-0400

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.
2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.
3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.
4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.
5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.
6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.
7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).
8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.
9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.
10. SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

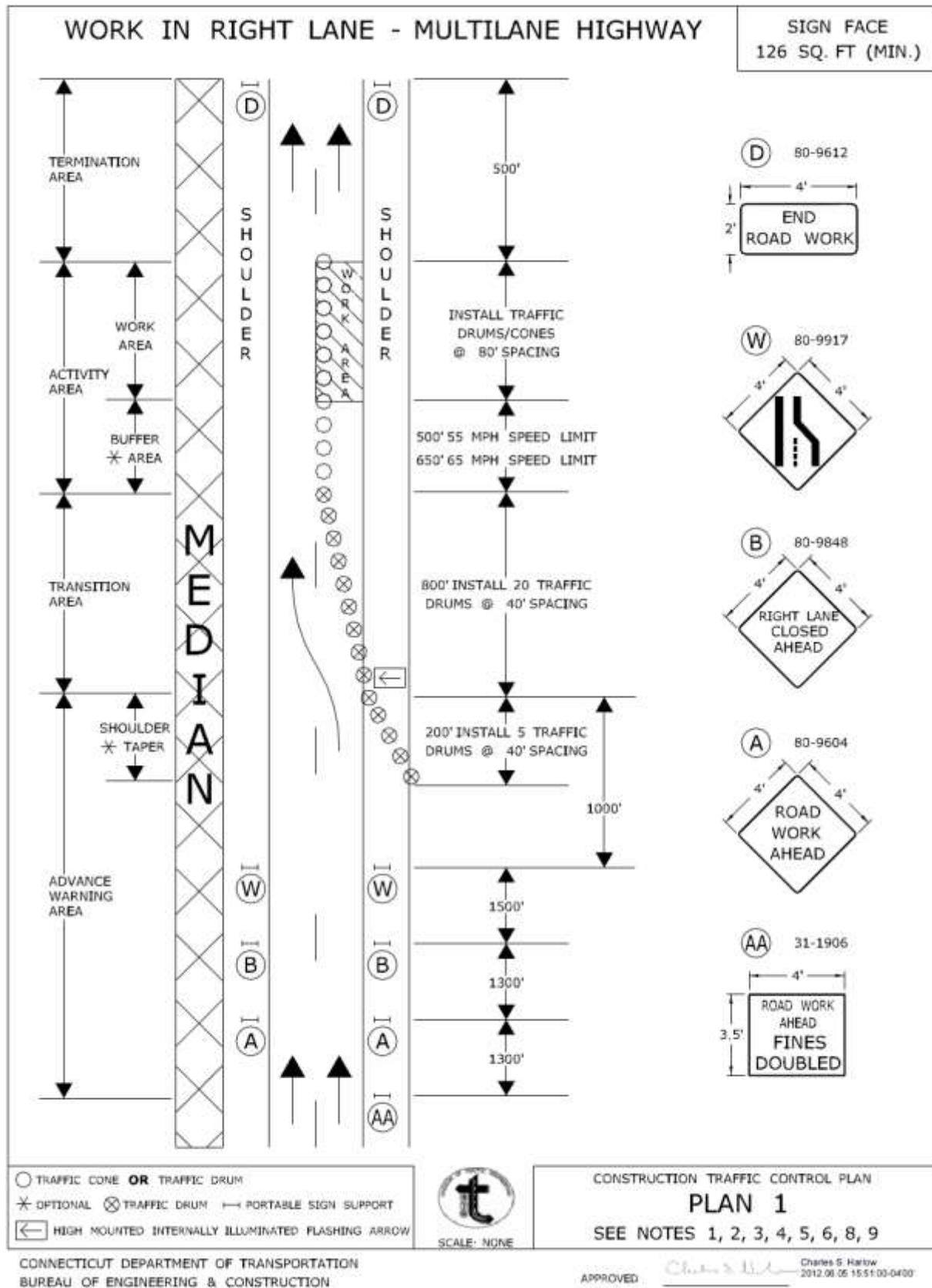
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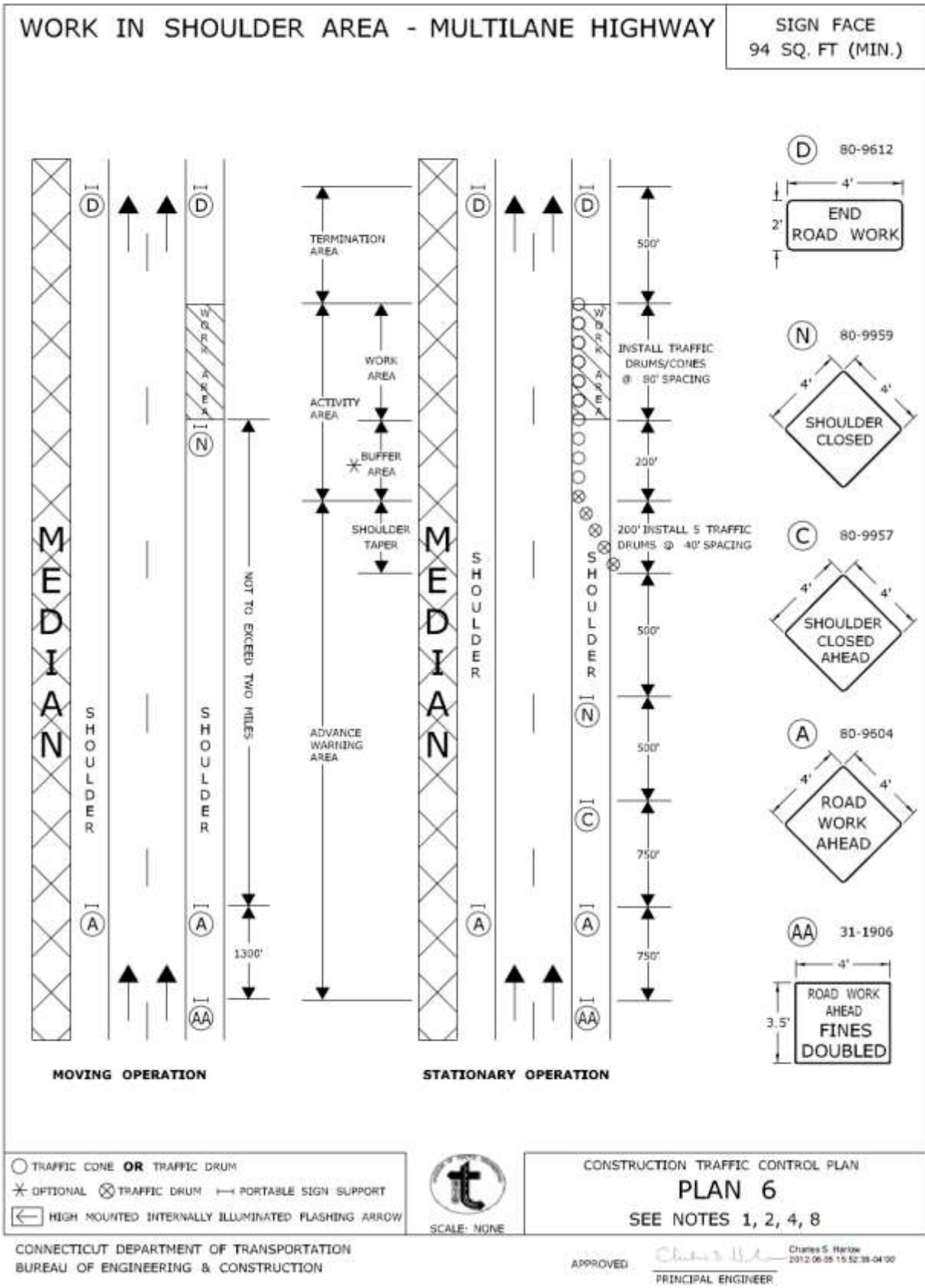
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

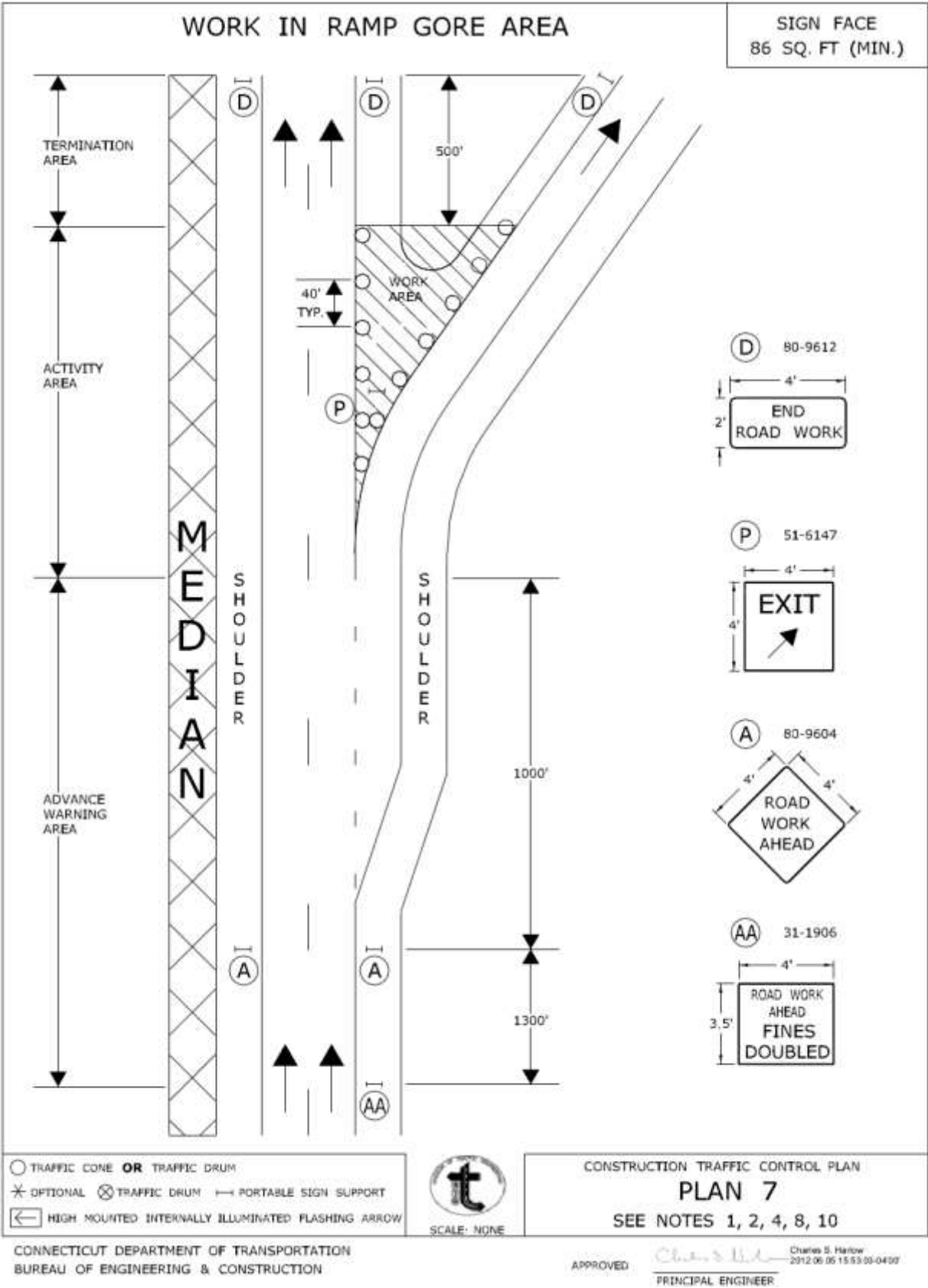
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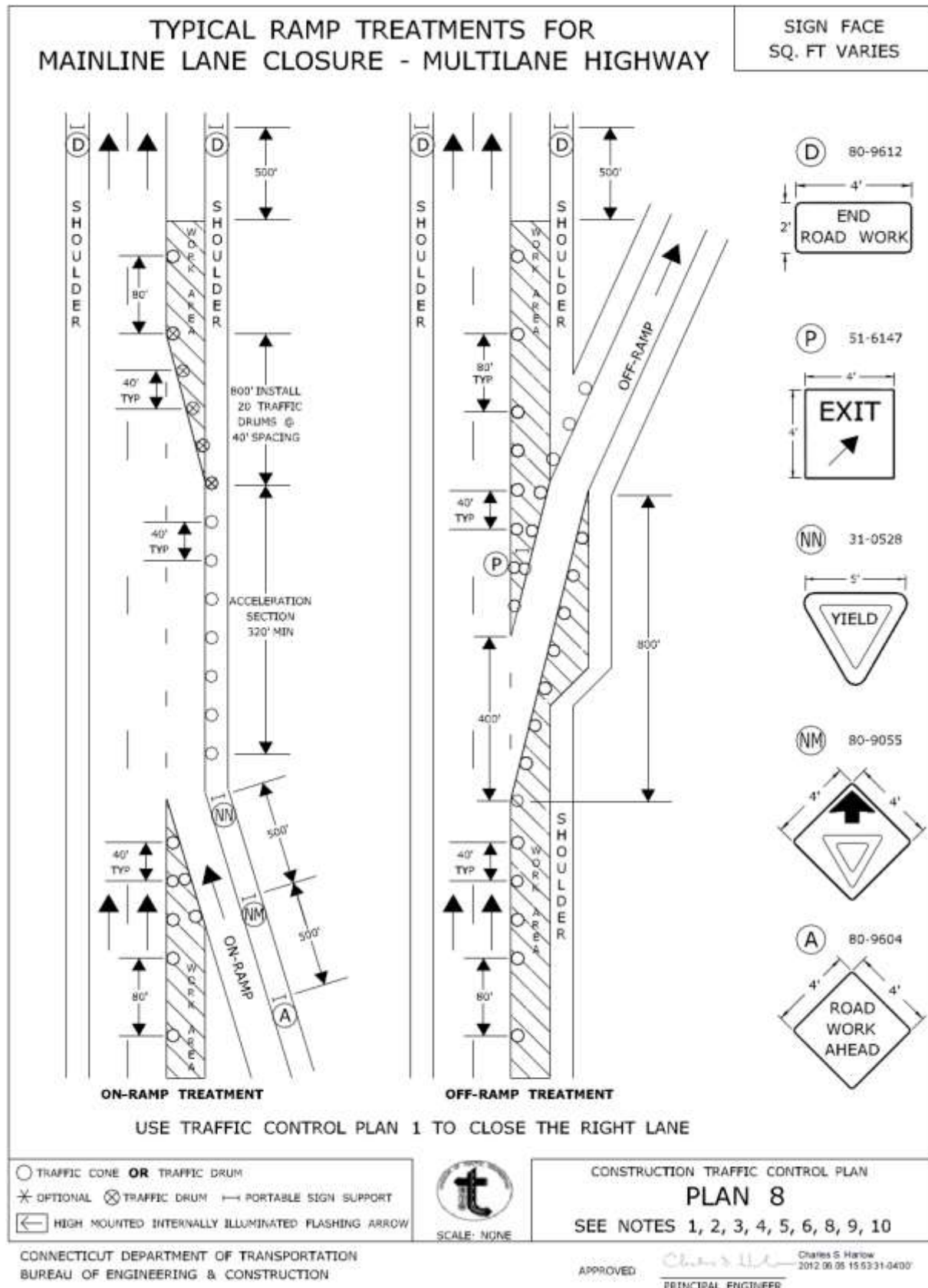
Charles S. Hachow
PRINCIPAL ENGINEER

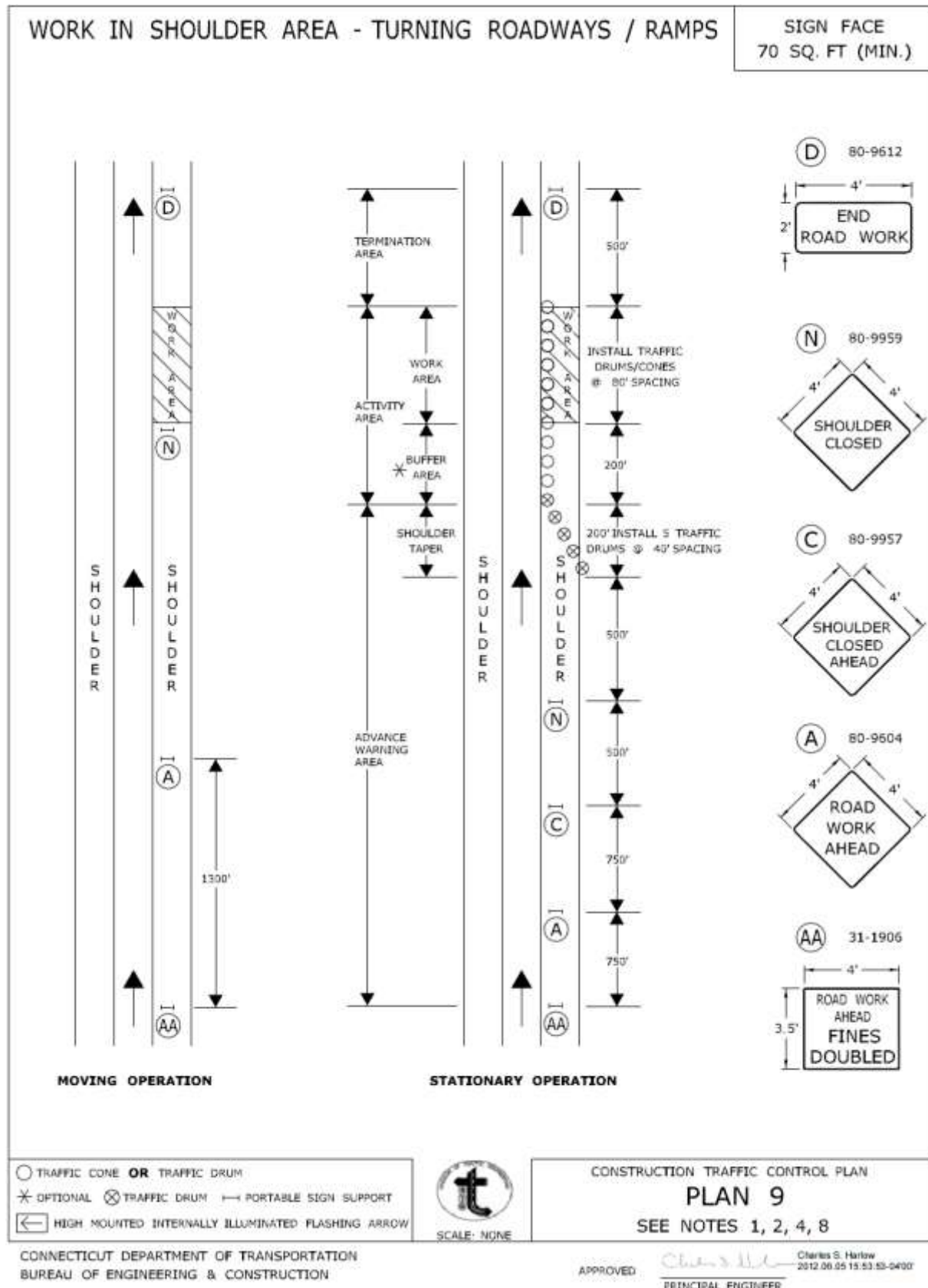
Charles S. Hachow
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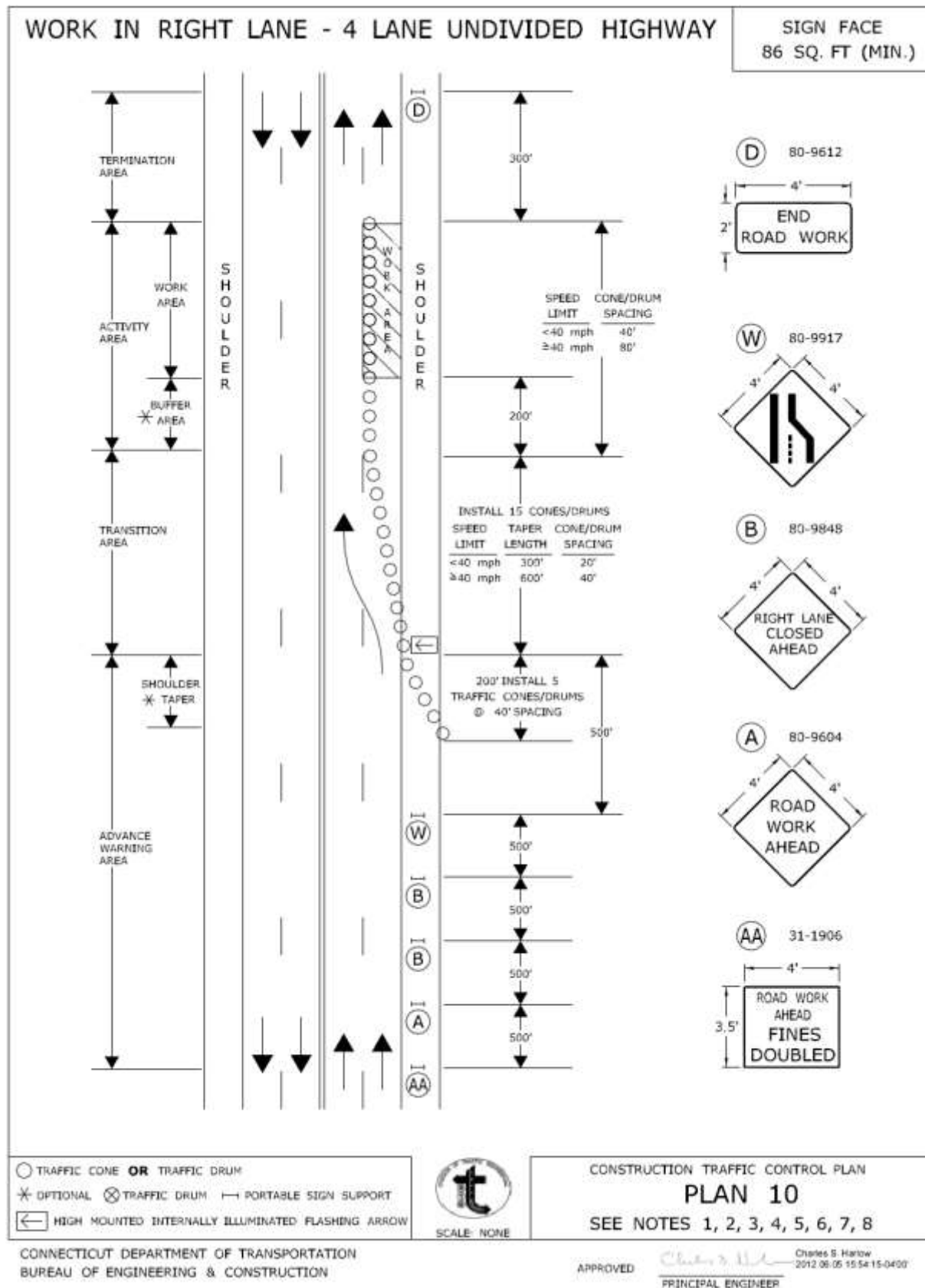


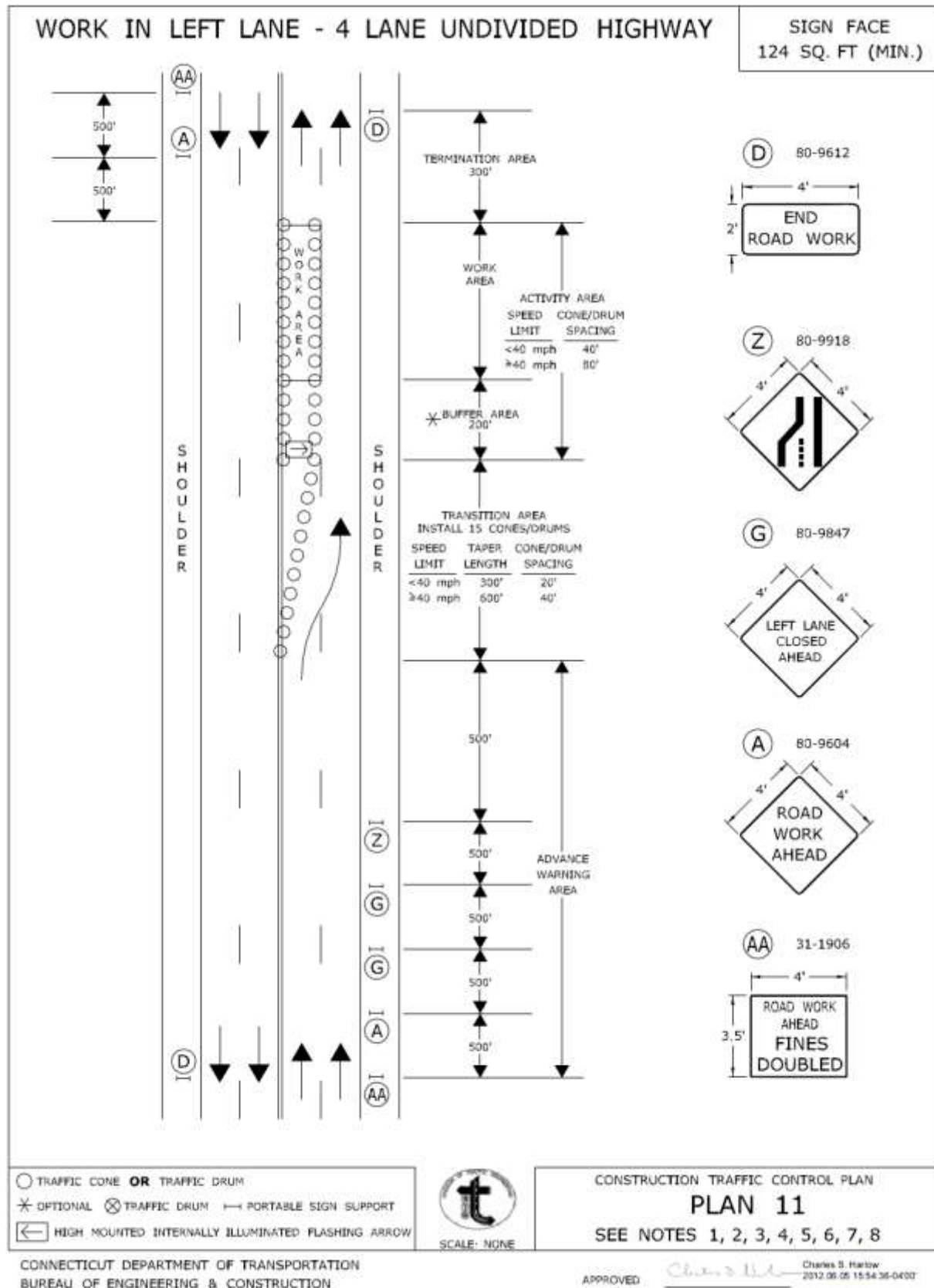


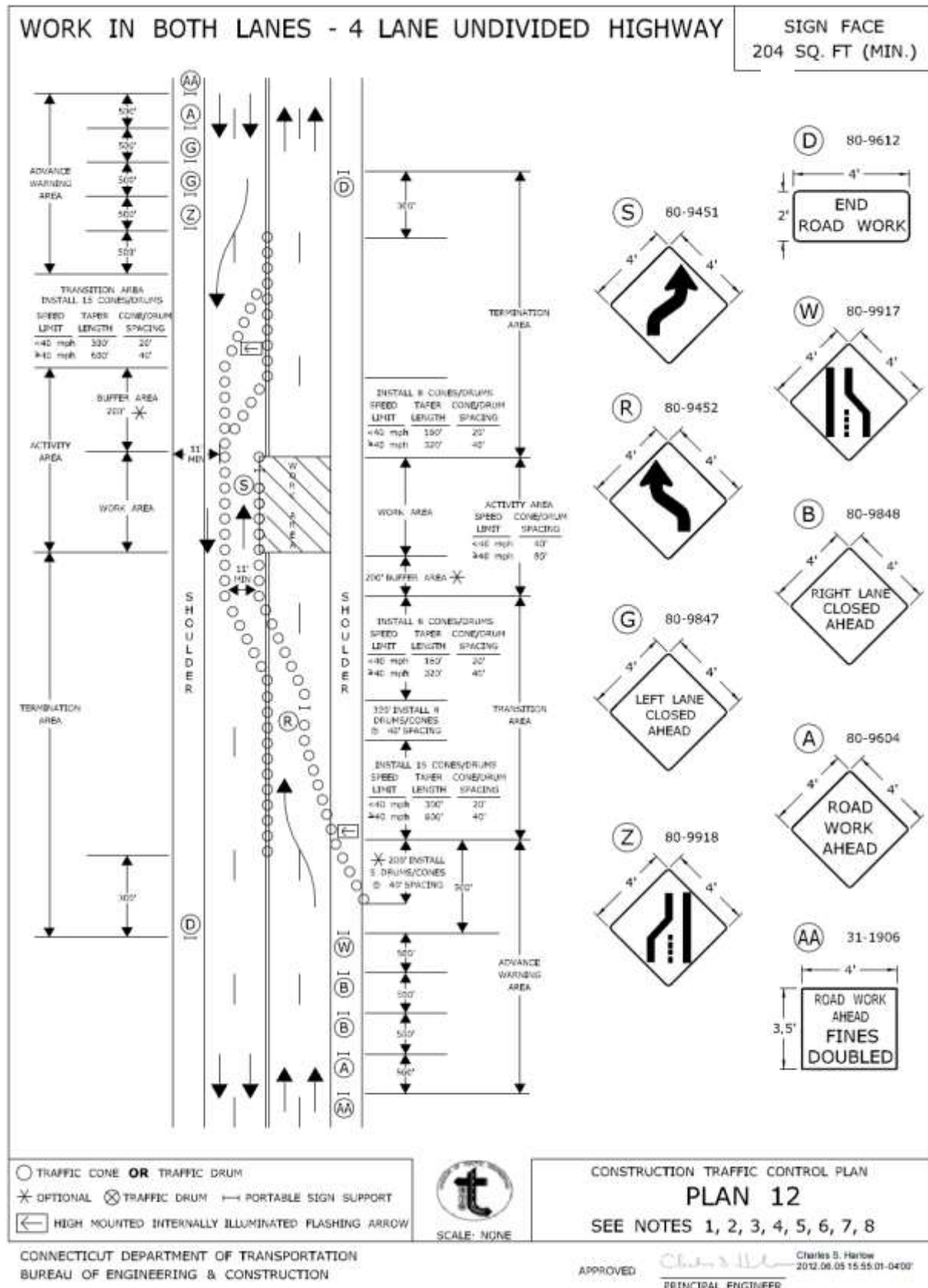


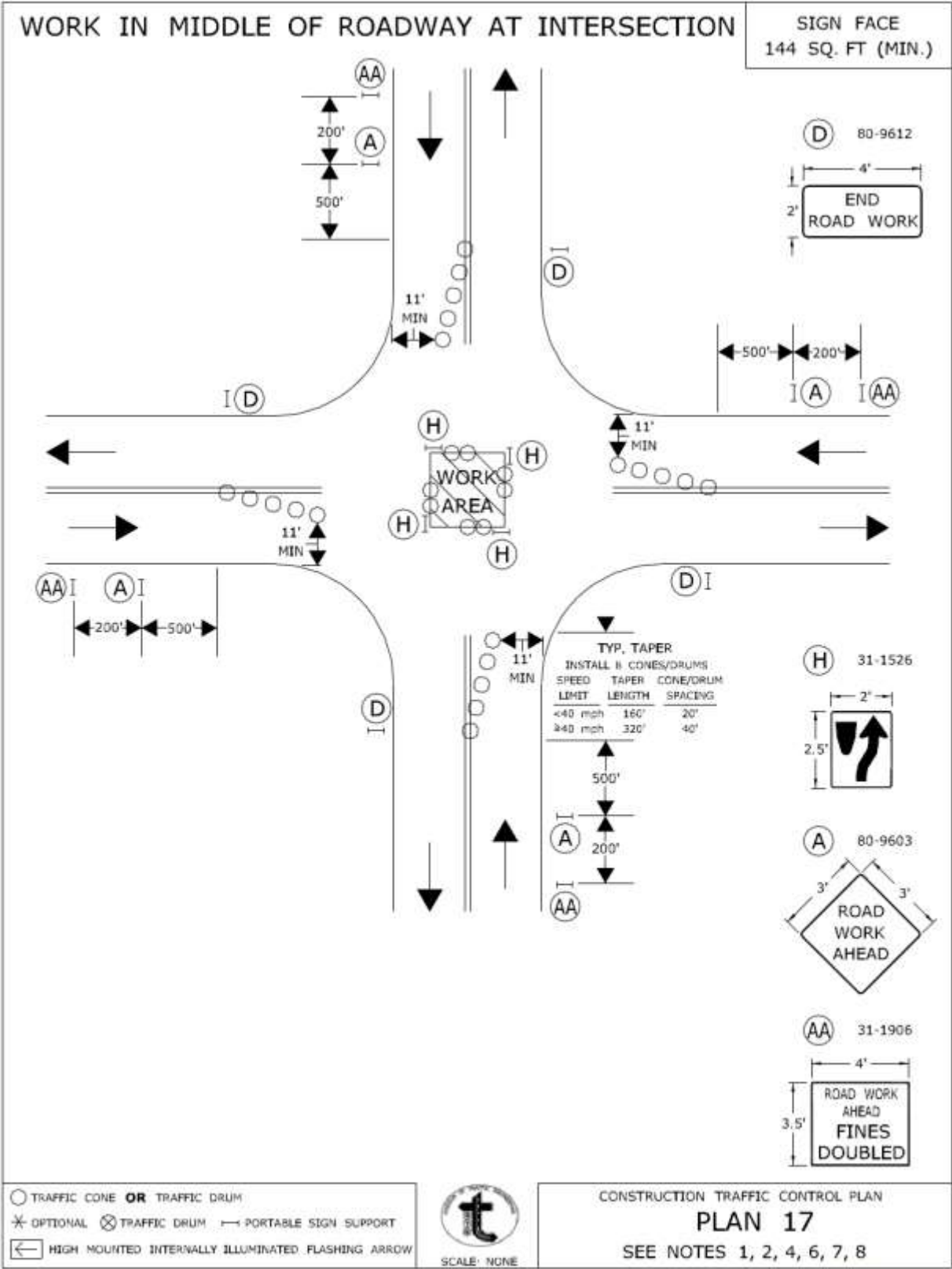












Article 9.71.05 – Basis of Payment is supplemented by the following:

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

ITEM #0974000A – REMOVAL OF EXISTING MASONRY

Work under this item shall conform to the requirements of Section 9.74 amended as follows:

Article 9.74.01 - Description: *Delete in its entirety and replace with the following:*

This work shall include the removal and satisfactory disposal of all concrete, reinforcing steel and anchor bolts to the limits shown on the plans, as directed by the Engineer, and in accordance with these specifications, the removal of which is necessary to the final completion of the work.

Article 9.74.02 - Construction Methods: *Add the following:*

The concrete shall be removed to the limits shown on the plans. The concrete shall be saw cut to delineate the removal limits. Pneumatic hammers or any other method approved by the Engineer may be used to remove the concrete. Maximum 15.5 lbs hammers shall be used near reinforcing steel that is to remain. Pneumatic tools shall not be placed in direct contact with the reinforcing steel that is to remain.

Reinforcing steel shall be cut and removed as shown on the plans. Loose and small concrete fragments shall be cleaned from the reinforcing steel required to be left in place.

All existing anchor bolts for existing metal beam rail attachments on endwalls shall be ground flush with existing concrete vertical face as shown on the plans and shall be primed with Zinc-Rich Primer. Zinc-Rich Primer shall be as approved by the Engineer.

The Contractor shall take necessary precautions to prevent any damage to the portions of the structure to remain. Any damage shall be repaired by the Contractor, as directed by the Engineer, and at no cost to the State.

When removing the concrete and reinforcing steel, the Contractor shall take necessary precautions to prevent debris from dropping to areas below the structure in to the stream or onto adjacent traffic lanes.

All debris shall be disposed of, from the site, by the Contractor.

Article 9.74.05 - Basis of Payment: *Delete in its entirety and replace with the following:*

This work will be paid for at the contract unit price per cubic foot for "Removal of Existing Masonry", which price shall include all equipment, tools and labor incidental to the removal of the material and the disposal thereof as directed by the Engineer.

Pay Item
Removal of Existing Masonry

Pay Unit
c.f.

ITEM #1002201A – TRAFFIC CONTROL FOUNDATION – SPAN POLE

Description: Work under this item shall consist of designing and constructing drilled shaft foundations for steel span poles, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall be dense, homogeneous, fluid, resistant to segregation and consolidate under self-weight. The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and a minimum of 705 lbs/cubic yard of cementitious materials. The initial concrete slump shall be 7" \pm 1". The concrete shall maintain a minimum 4" slump for the duration of the concrete placement. The concrete shall contain 1% - 7% air entrainment. The 28 day minimum compressive strength of the concrete in the constructed foundation shall be 4,000 psi. The concrete mix design, including admixtures, shall be submitted to the Engineer for approval.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Article M.15.09.

Ground rods shall be 5/8" in diameter by 10'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each drilled shaft foundation location consists of cohesionless, medium dense, granular soil (AASHTO A-1 or A-2) with cobbles present and a high

groundwater table which requires the use of wet construction/concreting methods. During excavation and construction of each foundation, should the Contractor encounter subsurface conditions that differ materially from those assumed at the time of bid, the Contractor shall notify the Engineer. All matters regarding increased cost relating to an agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

The design of drilled shaft foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation. The need and extent of all subsurface explorations and investigations shall be determined by the Contractor.
- The specified compressive strength, f'_c , of the concrete used in the design shall be 4,000 psi.
- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.
- The foundation shall be designed for the span pole reactions of all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.
- The diameter of the drilled shaft foundation shall be 3'-0", unless otherwise allowed by the Engineer.
- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.
- The design of the drilled shaft embedment depth shall account for the slope of the finished grade.
- The minimum embedment for a drilled shaft foundation, constructed entirely in soil, shall be no less than 12'-0" below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, constructed entirely in rock shall be no less than 8'-0" below the finished grade at the low side of a sloping grade.
- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear

and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.

- The load factor method shall be used for the structural design of the drilled shaft foundation. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete”, ACI 318.
- The structural design of the drilled shaft shall be based on stress and strain compatibility in the circular drilled shaft cross section. The use of methods equating circular to rectangular drilled shaft cross sections is not permitted.
- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion.
- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The minimum clear distance between longitudinal reinforcing bars shall be no less than 5 times the maximum aggregate size or 5”, whichever is greater. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.
- The drilled shaft foundation shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the transverse reinforcement shall be #4. The maximum spacing/pitch of the transverse reinforcement shall be no more than 6”. The minimum spacing/pitch of the transverse reinforcement shall be no more than 4”. The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices shall be alternated.

- The design of the foundation shall be coordinated with the traffic structure to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

The Contractor's foundation designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. A Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for each span pole foundation to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for **each** span pole foundation. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each span pole foundation shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- foundation working drawings
- foundation design computations

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation to interpret the computations and drawings, and to resolve any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a

rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- traffic structure reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the drilled shaft is adequate for all group load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the span pole foundation contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation in accordance with Subarticle 1.05.02-3. The drawings shall be reviewed and stamped approved (or approved as noted) by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the "Engineer of Record".

Concrete and Slurry Mix Designs: The Contractor shall submit to the District Engineer the concrete mix design and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the District Engineer a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including removal of obstructions and removal of excavated spoils; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction.

The Engineer will evaluate the foundation construction procedure for conformance with the contract documents and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, clamming, scraping, or other means

approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent

rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24" of the top casing and at least 48" above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting	Test Method
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(in Hole)			
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10'-0" for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

If directed by the Engineer, the top of the shaft shall be formed square with the length of the sides matching the diameter of the shaft.

Concrete construction shall conform to Subarticle 6.01.03-2,3,4,5 and 6 as amended herein.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full and good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than 1/2" over one-half the base is acceptable.

In wet (slurry) construction, concrete is to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-7, 9 and 10.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

The span poles shall not be erected on the foundation until the concrete in the shaft has attained a 28 day compressive strength, f'_c , greater than or equal to 4,000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted.

The work to remove rock from the foundation excavation will be measured from the top of rock to the bottom of rock excavation.

Basis of Payment: The work will be paid for at the contract unit price each for "Traffic Control Foundation – Span Pole," completed and accepted in place, which price shall include all equipment, materials, tools and labor incidental to the subsurface exploration, design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil and seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surfaces to be restored.

When rock is encountered within the limits of excavation, its removal will be paid for at the contract unit price per vertical foot for "Rock in Foundation Excavation," which price shall include any additional excavation to remove the rock and any additional concrete required to fill the excavation beyond the designed foundation hole dimensions. Rock, in so far as it applies to "Rock in Foundation Excavation," shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures or Portland cement concrete pavement which has a cross-sectional area that exceeds 50% of the cross-sectional area of the designed foundation hole.

ITEM #1003906A – REMOVE LIGHT STANDARD

DESCRIPTION: Under this item the contractor shall remove an existing light standard with transformer base (where present), bracket, and luminaire as indicated on the plans or as directed by the Engineer. The removed light standard, transformer base, bracket, and luminaire, shall remain the property of the Contractor.

CONSTRUCTION METHODS: The Contractor shall remove a light standard, transformer base (where present), bracket, and luminaire, where required. The removed materials shall remain the property of the Contractor.

All H.I.D. lamps shall be removed from the luminaire, by the Contractor, and handled as a hazardous waste and subject to the provisions of the Resources Conservation and Recovery Act (RCRA) Subtitle C and Chapter 446 of the Connecticut General Statutes. They may not be land-filled or incinerated, but must be handled and disposed or recycled at an approved facility.

Remote ballasts (where present), fuse kits, and wire shall be disposed of by the Contractor.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards with associated equipment removed and disposed of or delivered to the specified location, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Light Standard" complete, which price shall include the removal of light standard with associated transformer base, bracket, luminaire, lamp, cable and hardware, delivering, disposing, hauling, storing, and including all materials, tools, equipment, labor and work incidental thereto.

ITEM #1003912A – REMOVE CONCRETE LIGHT STANDARD BASE

DESCRIPTION: Under this item the contractor shall remove an existing concrete light standard base where shown on the plans or as directed. The removed concrete base shall remain the property of the contractor.

CONSTRUCTION METHODS: The contractor shall remove a concrete light standard base where required. The removed base shall be properly disposed of by the contractor. The hole shall be backfilled and graded to match surroundings, unless otherwise noted on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of concrete light standard bases removed and disposed of, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Concrete Light Standard Base", which price shall include all materials, equipment and work incidental thereto including excavation, backfill when necessary, hauling and disposing of concrete base.

ITEM #1003916A – REMOVE AND RELOCATE LIGHT STANDARD

DESCRIPTION: Under this item the Contractor shall remove, temporarily store as required, and install an existing light standard where shown on the plans, or as directed by the Engineer. The installation shall consist of erecting the light standard with bracket, ballast, luminaire and lamp on the new foundation, and making all necessary electrical connections for proper operation.

MATERIALS: The Contractor shall be responsible for damage to all equipment and materials incurred during removal and hauling to the specified area. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

Breakaway fuse connectors and fuses shall conform to Section M.15.05.

No. 10 single conductor shall be #10 AWG, THHN, rated for 600 volts. No. 8 bare grounding conductor shall conform to M.15.13.

CONSTRUCTION METHOD: The Contractor shall remove a light standard, bracket, luminaire and ballast where required, or as directed by the Engineer. The removed light standard, transformer base, bracket, luminaire, attachment hardware, shims, and load side conductors shall be properly stored as a unit at a location not to pose a hazard to motorists or cause damage to the unit. Upon installation of the new concrete foundation (paid for under a separate bid item), the completely assembled light standard shall be re-installed plumb with the aid of aluminum shims, if necessary. The bracket shall be securely attached to the light standard and the assembly shall be erected with the bracket placed perpendicular to the center line of the roadway.

The existing No. 10 AWG conductors from the luminaire ballast shall be connected to the lighting circuit conductors in the pole base with new breakaway type fuse connectors. If the existing No. 10 conductors are of insufficient length, then new No. 10 conductors shall be installed between the luminaire and pole base. The light standard shall be connected to the grounding system and ground rod with a No. 8 bare copper grounding conductor.

The Contractor shall make all necessary arrangements with the District Electrical Maintenance Supervisor, for locking and unlocking of the circuits on which any work is to be done, through the Engineer.

All work shall be in strict conformance with the National Electric Code.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of light standards removed and relocated, complete and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "Remove and Relocate Light Standard" as specified, which price shall include removal, storage, delivery, and installation of the light standard with bracket and luminaire, breakaway fuse holders, fuses, conductors, connections, and all work, materials, tools and equipment incidental thereto.

ITEM #1008907A – CLEAN EXISTING CONDUIT

Description:

The work under this item shall consist of cleaning existing conduit, as required, as shown on the plans or as directed by the Engineer to facilitate installation of new cable.

Construction Methods:

The Contractor shall remove all existing cable from conduit that will be reused. The contractor will be directed the clean the conduit which has obstructions or is found to be impassable. This cleaning process shall be by one of the following methods:

- 1) Rodding
- 2) A high pressure jet spray, or air pressure
- 3) By pulling a mandrel or ball through the conduit.

The Contractor shall submit in writing his anticipated method of cleaning the conduit to the Engineer for approval prior to cleaning any conduit.

If the conduit is found to be damaged to any extent that the cleaning process will not clear the obstruction, it will be the judgment of the Engineer whether to replace the entire conduit run or excavate the damaged section for repair.

Method of Measurement:

This work shall be measured for payment on an hourly basis.

Basis of Payment:

The work under the Item “Clean Existing Conduit” shall be paid for at the contract unit price per hourly basis, which price shall include all cleaning, material, tools, equipment, all labor, and work incidental thereto.

ITEM #1010902A – REMOVE CONCRETE HANDHOLE

DESCRIPTION: Under this item the Contractor shall remove an existing concrete handhole where shown on the plans or as directed. The removed concrete handhole shall be disposed of by the Contractor.

CONSTRUCTION METHODS: The Contractor shall remove and dispose of a concrete handhole where shown on the plans or as directed. The hole shall be backfilled and graded to match surroundings, unless otherwise noted on the plans.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of concrete handholes removed and disposed of, complete and accepted.

BASES OF PAYMENT: This work will be paid for at the contract unit price each for "Remove Concrete Handhole", which price shall include all materials, equipment and work incidental thereto including excavation, removal, backfill when necessary, hauling and disposing of the concrete handhole.

ITEM #1014901A – REMOVE CABLE

DESCRIPTION:

The work under this item shall include the removal and legal disposal of Incident Management System (IMS) fiber optic cable and electric service cable and conductors where shown on the plans or as directed by the Engineer.

MATERIALS:

The Contractor shall be responsible for damage to all equipment and materials incurred during removal, hauling and disposal. All repairs or replacements due to damage or loss by the Contractor shall be made at the Contractor's expense.

A 1/4" (6 mm) polyester rope (pull line) shall be installed in all abandoned conduits for future pulling purposes.

CONSTRUCTION METHOD:

Removal of existing IMS fiber optic cable and electrical service cable/conductors shall be performed in a manner and sequence not to damage portions of the cable that shall remain or other adjacent or nearby appurtenances. The Contractor shall install a 1/4-inch (6 mm) poly pull line for future use within any and all conduit where the IMS fiber optic cable has been removed. The pull line shall have sufficient length at each end and be neatly tied off within the nearest manhole, handhole, or pullbox.

METHOD OF MEASUREMENT:

This work will be measured for payment by the actual number of linear feet (meters) of IMS cables and electrical service cable/conductors removed.

BASIS OF PAYMENT:

This work will be paid for at the contract unit price per linear foot (meter) for "Remove Cable" as specified, which price shall include removal, storage, disposal, installation of polyester pull line, and all work, materials, tools and equipment incidental thereto.

Pay Item
Remove Cable

Pay Unit
l.f. (m)

ITEM #1017032A – SERVICE (METERED)

Description:

Furnish and install a metered electric service at the location shown on the plans or as directed by the Engineer.

Materials:

- Meter Socket
 - UL listed
 - Manual lever bypass
 - Locking metal cover for the glass enclosure
 - Contact the serving utility company for a list of approved meter sockets
- Conduit Bond Clamp
 - UL listed
 - Rated for direct burial

Locations served by United Illuminating (UI)

Meter socket rated at 100 amps

Locations served by Eversource

Meter socket rated at 200 amps

Enclosure capable of accepting a 3 inch (75 mm) rigid metal conduit (RMC)

Construction Methods:

Comply with the National Electric Code (NEC), the Department of Public Utilities Control (DPUC), and the serving power company requirements. Install a meter socket with associated equipment on the outside of the controller cabinet, as shown on the plans. Mount the enclosure approximately 54 inches (1.37 meters) above the ground. Install an expansion fitting in the RMC between the ground and the enclosure. Attach a direct-buried bond clamp to the service RMC below ground level, adjacent to the foundation. Bond the service conduit to the controller cabinet ground rod. Install a continuous nylon pull rope of at least 200 lbs (90 Kg) breaking strength in the conduit between the meter socket and the service source. Ensure all circuit breakers are off when service is connected by the utility company. The work must be inspected and approved by the Engineer or his designated representative prior to scheduling a service connection. Record the meter number and the date service is connected for billing purposes.

Service Request

- Traffic Signal on State Road: Contact the CT DOT Traffic Electrical office to complete the necessary service request forms.
- Traffic Signal on Town Road: Complete all necessary request forms and forward to the appropriate power company office.
- Incident Management Site: Complete all necessary request forms and forward to the appropriate power company office.

Locations served by Eversource

Contact the Eversource office to have a Job Number assigned. When the work is complete notify the Engineer to inspect and confirm that the work is according to the National Electric Code. Request that the Engineer contact the Eversource, Work in Progress office, to report the job number and to schedule a service connection.

Method of Measurement:

The installation of the Service (Metered) will be measured for payment by the number of metered electric services of the type specified, completed, with service connected, and accepted in place.

Basis of Payment:

This work will be paid for at the contract unit price each for "Service (Metered)" complete and accepted in place. The price shall include all material above ground such as the meter socket enclosure, surface conduit, expansion fitting, coupling, and load side service conductors. The price shall also include the direct-buried ground clamp, bonding wire, pull rope, all material, equipment, tools, labor and incidentals necessary.

The power company will provide the line-side conductors and the meter.

ITEM #1017033A – SERVICE CABINET**Description:**

The work under this item shall consist of furnishing and installing a complete service cabinet of the type specified at the locations shown on the plans or as directed by the Engineer and in accordance with these specifications. The service cabinet shall have single service to feed CCTV site.

Materials:

The service cabinet shall be manufactured to NEMA type 3R requirements of an aluminum alloy wall thickness of 1/8 in (3 mm), with a hinged weatherproof gasketed door, stainless steel handle and tumbler-type Conn-1 lock. The pedestal mounted cabinet shall be approximately 36 in (900 mm high), 24 in (400 mm) deep, and 16 in (500 mm) wide in size or the equipment in volume.

The foundation shall conform to Section 10.02.

The pedestal shall conform to Section 11.02, 3 ft (900 mm) Aluminum Pedestal.

Ground rod shall conform to Article M.15.15-7.

Trenching and Backfilling shall conform to Section 10.01.

Rigid Metal Conduit shall conform to Section 10.08.

Cable shall conform to Section 11.13 and these specifications.

A meter socket shall be provided on the outside of the service cabinet and shall be paid for under its contract item.

A 3/4 in (20 mm) marine-grade plywood backboard painted black shall be provided.

A neutral and ground bus bar shall be mounted in the rear of the cabinet.

The circuit breakers shall be thermal magnetic type. The number of poles, voltage rating and current ratings shall be as shown on the plans.

Construction Methods:

The Contractor shall completely install the conduit, foundation, pedestal, cabinet, wiring, circuit breakers, bus bars, backboard and required equipment as indicated on the plans or as directed by the Engineer. The Contractor shall install the service cabinet at locations shown on the plans or as directed by the Engineer. The Contractor shall install in the pedestal foundation one spare 2 in (50 mm) RMC conduit sweep.

The service cabinet should be located behind metal beam rail, beyond fixed objects such as proposed wood poles or utility poles, abutments and beyond the travel way. The location of the service cabinet should not create an obstacle in the sight line of vehicles traveling on the adjacent roadways. The location of the service cabinet shall be adjusted with respect to roadway geometry as directed by the Engineer.

The service cabinet shall provide power to a VMS cabinet as indicated on the plans.

Method of Measurement:

This work will be measured for payment by the number of service cabinets installed, complete and accepted. Each service cabinet will be measured for payment regardless of single or multiple services.

Basis of Payment:

This work will be paid for at the contract unit price each for "Service Cabinet" complete and accepted in place which price shall include the cabinet, trenching and backfilling, foundation, pedestal, circuit breakers, bus bars, backboard, conduit, cable, and all equipment, tools, labor, and work incidental thereto.

ITEM #1017034A – INSTALL SERVICE

Description:

The work under this item shall consist of the Contractor coordinating and scheduling the service installations/connections of the electrical service by the Utility Company from the utility service source to the meter socket on the service cabinet, Traffic Management System (TMS) cabinet, Traffic Management System Mini Hub (TMSMH) cabinet, Highway Advisory Radio (HAR) cabinet, Variable Message Sign (VMS) cabinet, Portable Variable Message Sign (PVMS) cabinet, or direct service connection from a cabinet or location with metered service to the TMS, TMSMH, HAR, VMS and PVMS cabinets. This work will also entail installation of the meter by the Utility Company, installation of riser conduit, installation of utility poles, installation of primary and secondary conductors, installation of transformers and transformer pads, and installation of conductors underground between the utility service source and the meter socket on the service, TMS, TMSMH, HAR, VMS or PVMS cabinet. The work shall also include energizing the metered or unmetered service connection.

The Utility Company may render a service charge to the Contractor for installation and connection of underground services. These charges are to be paid for under this item. This item will include all associated utility work to have power installed into the meter socket and energized. The IMS site plans detail in general the work that needs to be accomplished. The work detailed on the IMS site plans and specified herein will be paid for under this item.

Materials:

The materials for this work shall conform to the special provisions herein, utility specifications and the National Electrical Code

Construction Methods:

The Contractor may install the service only after contacting and obtaining approval from the Utility Company. A representative of the Utility Company must be present for work involved with installing electric service from a manhole or pad mounted transformer/transclosure, unless otherwise directed by the Utility Company.

Under this item, the Contractor shall verify the load requirements of the system components for each TMS, TMSMH, HAR, VMS and PVMS location and notify the Engineer of any potential changes in electric service that may result in inadequate service connections. The Contractor shall verify the type and size of electric service cable to be used for electric service from a cabinet or location with metered service to the TMS, TMSMH, HAR, VMS and PVMS cabinets, as shown on the site plans.

The Contractor shall contact the Utility Company representatives listed on the site plans at least 30 days in advance to coordinate the service connection work to be performed by the Contractor

and the Utility Company. The date the service is connected and energized shall be recorded for billing purposes and provided to the Engineer or his designated representative. All work performed by the Contractor under this item shall be in accordance with utility requirements and the National Electrical Code. The Contractor shall obtain the necessary utility specifications prior to any service work.

The Contractor shall make all arrangements with the utility company and complete the required service request forms for all service locations. Billing for the monthly energy charges shall be to the following:

State Of Connecticut Department of Transportation
P.O. Box 317546
Newington, CT 06131-7546

This item shall include all required service conductors on the load side of the meter socket.

All circuit breakers in the cabinet shall be off when service is connected by the utility company.

At all locations, the service installation shall be inspected and approved by the Engineer or his designated representative prior to the service being energized.

Method of Measurement:

This work will be measured for payment by the number of electric services installed, energized, complete and accepted by the Engineer and Utility Company.

Basis of Payment:

This work will be paid for at the contract unit price for each "Install Service", complete, energized and accepted in place, which shall include meter, service conductors between utility service source and meter socket, load side service conductors, riser conduit, utility poles, primary conductors, secondary conductors, transformers, transformer pads, all Utility Company charges, and all materials, equipment, tools, labor and incidentals thereto.

ITEM #1019027A – PREASSEMBLED AERIAL CABLE

DESCRIPTION: This work shall consist of furnishing and installing pre-assembled aerial cable, with insulators and brackets, on proposed poles at the location indicated on the plans to maintain illumination circuits.

MATERIALS: Pre-assembled aerial cable shall be 7 strand aluminum containing a No. 6 AWG bare messenger with three No. 6 AWG cross-linked polyethylene insulated conductors rated at 600 volts.

CONSTRUCTION METHOD: The pre-assembled aerial cable shall be attached to poles with insulators, including all connections as indicated on the plans or as directed by the engineer. When necessary, the pre-assembled aerial cable shall be relocated to maintain different illumination circuits as dictated by the construction stages. Pre-assembled aerial cable used for temporary lighting shall be removed once the permanent lighting is installed and operational. Removed aerial cable shall remain the property of the Contractor.

Pre-assembled aerial cable shall be used to maintain ramp lighting circuits and mainline circuits where the need for large diameter cable is not necessary to maintain proper voltage drop levels.

METHOD OF MEASUREMENT: This work will be measured for payment by the actual number of linear feet of pre-assembled aerial cable installed and accepted, including attachments.

BASIS OF PAYMENT: This work will be paid for at the contract unit price per linear foot for "Pre-Assembled Aerial Cable" of the size and voltage specified, complete in place, which price shall include, insulators, entrance cap and attachment, bracket, all materials, tools, connections, equipment, labor, and work incidental thereto. The unit cost for this item is a one time only cost. The cost of removing and relocating the aerial cable to maintain different illumination circuits shall be included in the unit cost.

ITEM #1020030A – TEMPORARY ILLUMINATION UNIT

DESCRIPTION: Under this item the Contractor shall furnish and install a fiberglass light pole, bracket, luminaire, and associated hardware, to be used for temporary lighting during construction, as indicated on the plans or as directed by the Engineer. At the end of the project the temporary illumination unit shall become the property of the Contractor.

MATERIALS: The pole shaft shall be fiberglass reinforced composite (FRC). The pole shaft shall be constructed by the filament winding process from thermosetting polyester resin and contain a minimum of 65 percent of “E” type fiberglass by weight. The filament windings shall be continuously applied with uniform tension and shall be placed on the pole helically at low angles to provide axial strength. Additional windings shall be placed on the pole in a circular manner to provide compressive strength. The pole is to be round, tapered, hollow, and reinforced in the support arm and hardware attachment areas. The pole is to be non-conductive and chemically inert. The pole shall meet the current AASHTO LTS-2 *Street Lighting Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, and shall be approved by FHWA for use on Federal Aid projects. A 2 ½” (63.5 millimeters) x 5” (127 millimeters) handhole shall be provided at the base of the pole shaft at approximately 18” (460 millimeters) above the finished grade line.

The pole exterior surface is to be grey with a natural (textured) finish. The surface of the pole will be uniform for the entire length of the pole. The laminate shall contain colored pigment, the color of the final coating, and be of uniform color throughout the entire wall thickness of the pole. A coating shall be applied to the pole to maintain surface integrity against the damaging effects of sunlight and extremes in weather. The coating is to be highly weather resistant pigmented polyurethane. The coating thickness shall have minimum dry film thickness of 1-1/2 mils (0.0381 millimeter).

The surface shall be tested for a minimum of 5000 hours of accelerated testing in accordance with ASTM G154 (UV-A lamp 340 NM wave length, 130° F (54.4° C), cycle lamp 4 hours on 4 hours off) with the following results: Fiber exposure: none, Cracking: none, Checking: none, Chalking: none, Color: may dull slightly.

The pole shall be suitable for direct burial and shall conform to the breakaway requirements of the current AASHTO *Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. For direct buried break-away poles the butt end shall be enlarged so as to provide resistance to rotation and pull out.

Where indicated on the plans, the pole shaft shall be equipped with an anchor base of heavy duty A356-T6 aluminum which shall be permanently bonded to the outside of the fiberglass shaft. The anchor base pole shall be installed on a concrete foundation, parapet anchorage, or other fixed anchorage as called for on the plans. The anchor base pole shall be non-breakaway, but shall be attached to the anchorage using breakaway couplings as indicated on the plans or as directed by the Engineer

Each pole is to be permanently marked in characters 3/16" (4.8 millimeters) minimum high on a brass or stainless steel plate with the manufacturer's identification symbol, month and year of manufacture. Each pole shall be individually packaged for protection during shipping and storage. The pole shall be warranted to be free of defects in materials and workmanship for a period of three years from the date of purchase.

The top of the pole is to be pre-drilled for two 5/8" (M16) thru bolts on 9-1/2" (241 millimeters) centers starting 4" (100 millimeters) below the top of the pole. A 1-1/2" (40 millimeters) wire exit hole shall be centered 1/2 the distance between the two holes.

A cast aluminum removable cap shall be securely mounted to the top of the pole. The cap shall be corrosion resistant and must remain in place when subjected to the maximum wind loading for which the pole is designed.

The luminaire bracket arm shall be 12' (3 meters) in length (single member) of an upsweep design fabricated from tubular aluminum. The luminaire end shall have a 2-3/8" (60 millimeters) outside diameter.

Anchors shall conform to the pertinent requirements of Article M.16.04-2b, c, d, and e.

The luminaire shall conform to the pertinent requirements of Article M.15.05, and shall be high pressure sodium. The luminaire wattage shall be 250 watt or as called for on the plans. The socket shall be adjustable to provide I.E.S. light distribution type M-C-II. The ballast shall be under guarantee of the manufacturer for a period of one year commencing when the unit is installed and accepted.

The contractor may re-use a temporary illumination unit which was salvaged from another Connecticut DOT project provided the unit meets the requirements of the current project, is in excellent structural condition, and retains full breakaway and operational performance. The contractor shall submit a shop drawing, Materials Certificate, and Certified Test Report for the salvaged temporary illumination unit. The Materials Certificate and Certified Test Report shall be in full compliance with the requirements of Section 1.06.07.

CONSTRUCTION METHOD: The fiberglass pole shall be set in the earth to the required depth and proper compaction of backfill provided around the pole and then attached to the anchors with guys as necessary. For anchor base poles the pole base shall be securely bolted to the anchor bolts of the fixed anchorage (breakaway couplings shall be used where directed). The bracket shall be attached to the pole and shall provide a luminaire mounting height over the roadway of 30'. The bracket and luminaire assembly shall be installed perpendicular to the center line of the roadway. When necessary, the temporary light pole and luminaire shall be relocated to maintain different illumination circuits as dictated by the construction stages.

Upon completion of the project the temporary illumination unit shall be removed and shall remain the property of the Contractor.

Upon removal of the pole, the resulting excavation shall be properly backfilled to match the surrounding area.

METHOD OF MEASUREMENT: This work will be measured for payment by the number of temporary illumination units installed and accepted.

BASIS OF PAYMENT: This work will be paid for at the contract unit price each for "TEMPORARY ILLUMINATION UNIT" complete in place, which price shall include all materials, fiberglass poles, breakaway base, anchor base (when required), anchors, guys, brackets, luminaires, lamps, ballasts, hardware, connections, hauling, and all equipment, tools, labor and all work incidental thereto including excavating, auguring, removal of bituminous overlay, backfilling, removal, hauling, relocation, and disposal. The unit cost for this item is a one-time only cost. The cost of removing and relocating the temporary illumination unit to maintain different illumination circuits shall be included in the unit cost.

ITEM #1103023A – 32' STEEL SPAN POLE**ITEM #1103024A – 34' STEEL SPAN POLE****ITEM #1103027A – 36' STEEL SPAN POLE**

Description: Work under this item shall consist of designing, fabricating and installing a steel span pole to carry traffic appurtenances (such as traffic signals, signs, etc.), of the type specified, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer.

Materials: The tubular components, such as the pole and luminaire arm shall be made of steel with a minimum yield stress of 35,000 psi.

The structural plate components, such as the baseplates and handhole frames shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The steel for pole members and structural plate components, such as the baseplates and handhole frames, shall meet the following Charpy V-notch impact testing requirements:

Yield Strength	Thickness in.	Minimum Test Value Energy ft.-lbs.	Minimum Average Energy, ft.-lbf
$F_y \leq 36 \text{ ksi}$	≤ 4	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	≤ 2	20	25 at 40°F
$36 \text{ ksi} < F_y \leq 50 \text{ ksi}$	$2 < t \leq 4$	24	30 at 40°F
$50 \text{ ksi} < F_y \leq 70 \text{ ksi}$	≤ 4 (100)	28	35 at -10°F
Charpy V-notch sampling and testing shall be in accordance with AASHTO T243, "P" piece frequency.			

The non-structural components, such as hand hole covers, caps and anchor bolt covers, shall be made of steel with minimum yield stress of 36,000 psi.

The filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695,

Grade 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Prior to shipping the anchor bolts, the nuts and washers shall be installed by hand on the anchor bolts to ensure that the nuts can be run on the threads. Only anchor bolts on which the nuts are free running shall be shipped. The anchor bolts shall be shipped with the nuts and washers on the threads.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Closed cell elastomer for sealing the space between the foundation and base plate shall conform to ASTM D1056, Grade 2A2 or 2A3 and shall have a pressure-sensitive adhesive backing on one side for adhesion to steel. Closed cell elastomer contained within the anchor bolt pattern shall not interfere with the anchor bolt leveling nuts and shall not block the opening in the base plate.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be stainless steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used for span pole members and structural plate components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers). The Certified Test Reports shall include the following:

- a. Mill test reports that indicate the place where the material was melted and manufactured.
- b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used for span pole members and components, high-strength bolts (including nuts and washers) and anchor bolts (including nuts and washers).

Construction Methods: The design and fabrication of the span pole, including its anchorage (into the foundation), shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, including the latest interim specifications, available prior to the advertising date of the contract, amended as follows:

- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.
- The minimum design life for span poles shall be 50 years.
- The wind importance factor, I_r , for wind pressure shall be 1.00.
- The span pole shall be designed to support free swinging traffic signals and signs. The wind drag coefficient for traffic signals and luminaires shall be no less than 1.2.
- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio (CSR) in any span pole component due to each group load shall not exceed 0.85. The purpose for limiting the CSR is to allow for future additional appurtenance configurations.
- The span pole shall be designed to support a span wire with a sag no greater than 5% of the span.
- The maximum luminaire arm length shall be 20'-0".
- The maximum diameter of the pole at the base shall be 18".
- The minimum wall thickness of the pole shall be 5/16". The wall thickness of the pole shall be uniform throughout its length. The use of multiple plies

(laminations) to obtain the required pole thickness is not permitted. The use of shop-fabricated stepped members is not permitted.

- The span pole shall be a tubular member with either a round or multisided cross-section. Multisided tubular members with other than 8, 12 or 16 sides are not permitted. Multisided tubular members with fluted sides are not permitted. The pole shall be fabricated with a taper (change in diameter).
- Multisided tubular members less than or equal to 13" in diameter shall have a minimum of 8 sides. Multisided tubular members greater than 13" in diameter and less than or equal to 18" in diameter shall have no less than 12 sides.
- Multisided tubular members shall have a minimum internal bend radius of 5 times the tubular member thickness or 1", whichever is greater.
- Slip-type field splices are not permitted in the pole.
- The pole may be fabricated with no more than 2 longitudinal seam welds. The seam welds shall be ground smooth and flush with the adjacent base metal.
- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds.
- 100% of partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. 100 % of complete joint penetration seam welds shall be non-destructively tested in accordance with the ultrasonic method.
- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with or without a backing ring. Backing rings may be connected to the inside surface of the tubular member with a continuous fillet welds only in tubular members greater than or equal to 16" in diameter. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method after fabrication and prior to galvanizing. 100% of the complete joint penetration groove welds shall also be non-destructively tested by the ultrasonic method for toe cracks after galvanizing. 100% of backing ring fillet welds shall be non-destructively tested by the magnetic particle method after fabrication prior to galvanizing. After galvanizing, at locations where the backing ring is not welded to the transverse plate or the tubular member, the joint between the backing ring and transverse plate or tubular member shall be sealed with silicone sealant to prevent the ingress of moisture.
- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining

base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.

- The use of stiffeners at tubular member to transverse plate connections is not permitted.
- The minimum base plate thickness shall no less than 2 ½" or at least as thick as the anchor bolt diameter, whichever is greater. The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.
- The opening in the base plate shall be sized to allow for proper galvanizing and allow conduits projecting from the foundation to pass through it. The size of the opening shall be kept to a minimum to reduce the flexibility of the baseplate.
- The pole base plate anchor bolt circle diameter shall be 24".
- The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The minimum distance from the center of the anchor bolt hole to the edge of the base plate shall be no less than 2 times the diameter of the anchor bolt. The anchor bolts shall use an embedded anchorage plate, ½" minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 8. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, whichever is greater. Each anchor bolt shall be supplied with 4 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted. The use of lock washers with the anchor bolt assembly is not permitted.
- The span wire pole clamp shall be shall be designed to support a minimum tensile force of 12,000 pounds or 3 times the maximum calculated tensile force in the span wire, whichever is greater.

The span pole shall be designed for the load effects due to the actual traffic appurtenances (signals, signs, luminaires, cameras, etc.). The span pole shall also be designed for the effects of traffic appurtenances during all stages of construction that may exist during the project under which the span pole is installed. The span pole shall be designed to support traffic appurtenances with properties no less than those tabulated on the plans.

The locations and dimensions of the span poles are shown on the traffic plans. The luminaire arm and pole lengths and the attachment heights shall be verified by the Contractor based on the finished grade at the site, top of foundation elevation, the locations of overhead utility cables and the traffic appurtenance mounting heights. If either the wire or pole length is inadequate, the Contractor shall notify the Engineer.

The minimum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 16'-0". The maximum vertical clearance from the top of the finished road to the bottom of the traffic signals shall be 18'-0". The traffic signals shall be installed so that the bottom of all the signals for each approach is at the same elevation.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes shall be coordinated with the galvanizer prior to the submission of the working drawings and design computations. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

A J-hook shall be welded to the inside of the pole at the top for wire handling and support.

The span pole shall have a handhole, reinforced with a frame, located at the base of the pole. The handhole shall be located with a normal direction that is 90° to the plane formed by the pole and span wire. The minimum clear distance from the top of the baseplate to the outside face of the bottom of the handhole frame shall be no less than the diameter of the tubular member or 1'-3", whichever is greater. The handhole frame shall have a minimum 4" wide by minimum 6" high clear opening. The maximum width of the handhole opening, the clear opening plus twice the frame thickness, shall not be greater than 40% of the tubular member diameter at that section. The inside corners of the handhole frame shall be rounded to a radius of 30% to 50% of the width of the clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the pole or 5/16", whichever is greater. The handhole frame shall be connected to the pole with a partial joint penetration groove weld reinforced with a fillet weld. The handhole weld shall start and end at the point that is coincident with the longitudinal axis of symmetry of the tubular member and the longitudinal axis of symmetry of the handhole frame. 100% of the weld shall be non-destructively tested in accordance with the magnetic particle method. The handhole shall be provided with a cover connected to the frame with no less than 2 stainless steel screws. The cover shall be installed with a neoprene gasket matching the dimensions of the cover. Cover and the gasket; and the gasket and the handhole frame shall be in firm and continuous contact after tightening the fasteners. The cover shall also be attached to the frame with a 1'-6" long stainless steel chain. The inside bottom of the frame shall have a hole tapped for the stainless steel grounding bolt.

The span pole shall include wire entrance fittings. The number and size of the wire entrance fittings shall be as shown on the plans. The fittings shall be welded, all-around, to the pole at a 45-degree angle to the pole.

The span pole shall be supplied with a pole cap plate and anchor bolt covers. The cap plates shall be attached with fasteners. The joint between the tubular member and plate shall be sealed with a neoprene gasket matching the dimensions of the plate.

The luminaire arms shall be fabricated of pipe with a minimum thickness equal to schedule 40. Single arm luminaires shall be used for luminaires with arm lengths less than or equal to 8'-0". Truss type luminaires shall be used for luminaires with arm lengths greater than 8'-0". The truss type luminaires shall consist of an upper and lower members joined with vertical members at the tip and midspan. To accommodate the luminaire fixture, the size of the pipe in the luminaire arm at the tip shall be 2" diameter, schedule 40. If necessary, a reducing tenon shall be installed at the tip of the arm to accommodate the luminaire fixture.

The luminaire arm(s) shall be connected to the pole with clamp connections. Each clamp connection shall use 4 high-strength bolts. The installed nuts shall be prevented from loosening while in service. The use of lock washers to meet this requirement is not permitted. The arms shall be fillet welded, all-around, to the clamp(s). The size of the weld shall be no less than 1/4". A hole shall be provided in the clamp, (upper arm clamp for truss type arms) and pole to allow for wires to pass from the pole to the luminaire arm. The sides of all holes in the connection shall be ground smooth and edges rounded by grinding to prevent the wires from chafing.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each span pole to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** span pole. **A single set of drawings with tabulated data for multiple span pole locations is not permitted.** The alpha-numeric span pole identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each span pole shall be submitted in an individual file in electronic portable document format (.pdf) with appropriate bookmarks and commenting enabled. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification

- copy of the traffic signal control plan detailing the span pole
- span pole working drawings
- span pole design computations
- welding procedures
- span pole installation procedure, including the method to plumb the pole

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation to interpret the computations and drawings, and to resolve any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

The electronic portable document format (.pdf) working drawings shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 1/4" wide x 1 3/4" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 1/2" x 11") letter sheets.

The working drawings shall include complete details of all span pole components. The drawings shall include, but not be limited to the following:

- the project number, town and span pole identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, vehicle speed, etc.
- material specifications for all components
- material designations for the pole, with an explanation of the alpha numeric characters (equivalent thickness, in inches, shall be provided for gage numbers)
- non-destructive weld testing requirements
- details of the location of the longitudinal seam weld(s) in the pole
- vent and drain holes for galvanizing
- a plan view of the anchor bolt layout relative to the orientation of the wire

- anchor bolt dimensions, including embedment and projection
- span pole installation procedure, including the method to plumb the pole

The design computations shall include, but not be limited to the following:

- the project number, town and alpha-numeric span pole identifier
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- a tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D (if round member); effective width, b (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness, t ; inside bend radius, r_b (if multisided member, AASHTO 5.5.2), cross-sectional area, A ; moment of inertia, I ; section modulus, S ; radius of gyration, r . AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.
- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations
- horizontal and vertical deflections due to Group Load Combinations I, II and III for dead, wind and ice loads

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The "Engineer of Record" is identified in the signature block on the span pole contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the

working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation
Research and Materials
Traffic Engineering
Traffic Signal Lab
Engineer of Record

The span poles shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication to the Standard for Bridge and Highway Metal Component Manufacturers (CPT).

Fabrication of the span pole may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be

identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the span pole members and components, shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and

components meet the galvanizing requirements herein. Only span pole members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

After fabrication and prior to shipping, aluminum identification tags shall be attached to the span poles with self-tapping tamper resistant screws.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The span pole shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the span pole designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the span pole. Changes to these method and procedures shall be submitted with the working drawings and computations.

Prior to installation of the span pole, the exposed threads of all the embedded anchor bolts shall be cleaned of accumulated dirt and concrete and lubricated. The threads and bearings surfaces of all the anchor bolt nuts shall be cleaned and lubricated. The anchor bolts and nuts are properly lubricated if the nuts can be turned by hand on the anchor bolt threads. The lubricant shall contain a visible dye of any color that contrasts with the color of the galvanizing. Re-lubricate the threads of the anchor bolts and nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

Install (turn) the leveling nuts onto the anchor bolts and align the nuts to the same elevation or plane. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1". Place a structural hardened washer on top of each leveling nut, 1 washer on each anchor bolt.

The pole shall be erected so that the centerline of the pole will be plumb after the application of all the dead loads. The pole may be initially installed raked in the opposite direction of the

overhead member to obtain the plumb condition. Raking the pole may be accomplished by installing the leveling nuts in a plane other than level.

Install the pole base plate atop the washers resting on the leveling nuts, place a structural hardened washer on each anchor bolt resting it on the top of the base plate, and install (turn) a top nut on each anchor bolt until the nut contacts the washer. The leveling nuts and washers shall be inspected, and if necessary the nuts (turned), so that the washers are in full contact with the bottom surface of the base plate.

Tighten the top nuts to a snug tight condition in a star pattern. Snug tight is defined as the maximum rotation resulting from the full effort of one person using a 12" long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star (e.g., For an 8-bolt circle with bolt sequentially numbered 1 to 8, tighten nuts in the following bolt order: 1, 5, 7, 3, 8, 4, 6, 2.).

Tighten leveling nuts to a snug tight condition in a star pattern.

Before final tightening of the top nuts, mark the reference position of each top nut in a snug-tight condition with a suitable marking on 1 flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern one-sixth of a turn beyond snug tight. Turn the nuts in at least two full tightening cycles (passes). After tightening, verify the top nut rotation. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

After erecting the span pole, the span pole shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a stainless steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

The traffic appurtenances shall be located and mounted on the wire as shown on the cross-sections. A span wire pole clamp shall be provided for each span wire connected to the pole.

After installation of the traffic appurtenances, the anchor bolt nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole base plate and the centerline of the pole shall be plumb.

After installation of the traffic appurtenances, a survey shall be performed by the Contractor to confirm that the sag is no less than 5% of the span and to confirm that the minimum vertical clearances from the top of the finished road to the bottom of the traffic appurtenances have been met.

The last character of the span pole identification number shall be stenciled with black paint, unless otherwise specified, on the pole of each span pole. The character shall be 3" high and placed approximately 12" above the top of the base plate facing the centerline of the roadway.

Method of Measurement: This work will be measured for payment by the number of span poles, of the type specified, completed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "XX Steel Span Pole" or "Steel Combination Span Pole", of the type specified, complete in place, which price shall include all equipment, materials, tools and labor incidental to the design, fabrication and installation, of the span pole at the locations specified on the plans.

ITEM #1105003A – 1 WAY, 3 SECTION SPAN WIRE TRAFFIC SIGNAL

Article 11.05.03 – Construction Methods:

Add the following paragraph:

Circular indications that have an identification mark (such as an arrow) on the top of the lens shall be installed with that mark at the 12 o'clock position.

Article M.16.06 - Traffic Signals

Sub Article 3 - Housing:

In the last sentence, between the words “housing” and “shall” add “and all internal hardware”.

Add the following after the last paragraph.

Each section of the housing shall be provided with a removable visor. The visor shall be the cap type, unless otherwise noted on the plan. The visor shall be a minimum .05 inch (.13 mm) thick. The visor shall be the twist on type and secured to the signal by four equidistant flat tabs screwed to the signal head.

Sub Article 4 - Brackets:

Add the following at the end of the last paragraph:

Install a 2” wide yellow retroreflective strip (Type IV sheeting) along the perimeter of the face of the backplate.

Delete Sub Article 5 - Optical Unit and Sub Article 6 – Lamp Socket and replace with the following:

Optical Unit, Light Emitting Diode:

(a) General:

Only Optical Units that meet the requirements contained herein supplied by the below manufacturers that have been tested by the Department’s Signal Lab will be accepted. Final approval for model numbers will be done at the time of the catalog cut submittals.

Duralight
Trastar, Inc.
860 N. Dorothy Dr., Suite 600
Richardson, TX 75081

GE Lighting Solutions
Corporate Headquarters
1975 Noble Road Building 338E
East Cleveland, OH 44112-6300

Dialight
1501 Foute 34 South
Farmingdale, NJ 07727

Leotek
726 South Hillview Drive
Milpitas, CA 95035

The materials for Light Emitting Diode (LED), Optical Unit, circular and arrow, shall conform to the following:

- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement for circular indications dated June 27, 2005.
- The ITE Performance Specification for Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement for arrow indications dated July 1, 2007.

Section 4, Adjustable Traffic Signals and General Housing sections of the **Department of Transportation Functional Specifications for Traffic Control Equipment, current edition governs**. Where the Department of Transportation Functional Specifications conflict with this Special Provision or the 2005/2007 ITE Performance Specifications, this Special Provision and the 2005/2007 ITE Performance Specifications shall govern.

The Optical Unit shall have an Incandescent look and be made up of a smooth surfaced outer shell, multiple LED light sources, a filtered power supply and a back cover, assembled into a sealed unit. The Optical Unit shall be certified as meeting the 2005/2007 ITE Specifications by Intertek Testing Services, Inc. (ITSNA, formerly ETL) or another organization currently recognized by the Occupational Safety and Health Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL.) The Optical Unit shall perform to the requirements of the ITE Specification for a minimum of 60 months.

A “Swing Test” will be performed by the Department to ensure no significant dimming or blanking occurs, until the lamp is obscured by the visor. All L.E.D Lamps will be subjected to further field testing for reliable operation.

The Arrow Optical Unit shall be “Omni-Directional” so that it may be oriented in a right, left or straight configuration without degradation of performance.

(b) Electrical Requirement:

Operating voltage:

80 to 135 Volts AC with cutoff voltage (no visible indication) below 35Volts AC.

Power requirements:

Circular Indications: 12", (300 mm) – no more than 16 Watts

Circular Indications: 8", (200mm) - no more than 16 Watts

Arrows Indications: 12", (300mm) - no more than 16 Watts

Power Supply:

Fused and filtered to provide excess current protection and over voltage protection from electrical surges and transient voltages.

(c) Photometric Requirement:

Beam Color:

Meet 2005/2007 ITE Specifications

(d) Mechanical Requirements:

Diameter:

The Circular Optical Unit shall fit into standard 12" (300mm) or 8" (200mm) housing.

The Arrow Optical Unit shall fit 12" (300mm) housings only.

Enclosure:

UV (Ultraviolet) stabilized polycarbonate back cover.

Clear lens cover for all Red, Yellow and Green Circular Optical Units.

For Arrow Optical Units the arrow indication segment of the lens shall be clear.

Enclosure sealed and waterproofed to eliminate dirt contamination and be suitable for installation in all weather conditions.

Clearly mark on the housing the following information:

- Manufacturer & model number
- Date of manufacture (must be within one year of installation)

The model number shall end with the number of LEDs used to comprise the unit as the last digits of the model number. Example, if the unit comprised of 3 LEDs and the model is x12y, then the new model number shall read x12y3.

Operating temperature:

Meet 2005/2007 ITE Specification

Wiring: L.E.D. lamps shall have **color coded 16 AWG wires** for identification of heads as follows:

RED L.E.D. Lamps	RED with WHITE neutral
YELLOW L.E.D. Lamps	YELLOW with WHITE neutral
GREEN L.E.D. Lamps	GREEN or Brown with WHITE neutral
RED L.E.D. ARROWS	RED/WHITE with WHITE neutral
YELLOW L.E.D. ARROWS	YELLOW/WHITE with WHITE neutral
GREEN L.E.D. ARROWS	GREEN/WHITE or BROWN/WHITE with WHITE neutral
GREEN/YELLOW LED ARROWS	GREEN/WHITE or BROWN/WHITE, YELLOW/WHITE, with WHITE neutral

Wires shall be terminated with a Block Spade, 6-8 stud/ 16-14 wire size.

All Circular Optical Units shall be supplied with a minimum 40" pigtail and all Arrow Optical Units Supplied with a minimum 60" pigtail.

Sub Article 9 - Painting:

Third coat: Replace the first two sentences with the following:

All brackets and hardware shall be painted yellow by the manufacturer. The color shall be No. 13538, Federal Standard No. 595.

ITEM #1106003A – 1 WAY PEDESTRIAN SIGNAL PEDESTAL MOUNTED

Section 11.06.02 Pedestrian Signal, Materials

Section M.16.07 C. Optical Unit

Delete 2. LED: and replace with the following:

General

- Meet requirements of current MUTCD Section 4E.
- Meet current ITE specifications for Pedestrian Traffic Control Signal Indications - (PTCSI) Part 2: Light Emitting Diode (LED).
- Meet CT DOT, 2008 - 2010 Functional Specifications for Traffic Control Equipment; Section 5D, LED Pedestrian Signal with Countdown Timer.
- Meet EPA Energy Star® requirements for LED Pedestrian Signal Modules.

Operational

- Countdown display only during the flashing Pedestrian Clearance (Ped Clr) Interval. Timer goes blank at end of flashing ped clr even if countdown has not reached zero.

Physical

- Sealed optical module to prevent entrance of moisture and dust.
- Self-contained optical module, including necessary power supplies.
- Designed to securely fit into standard housing without the use of special tools or modifications to the housing.
- Identification information on module: manufacturer's name, model number, serial number, and date code.

Optical

- Multiple LED sources; capable of partial loss of LED's without loss of symbol or countdown message.
- Two complete self contained optical systems. One to display the walking person symbol (walk) and the hand symbol (don't walk). One to display the countdown timer digits.
- Visual Image similar to incandescent display; smooth, non-pixelated.
- Symbol and countdown digit size as shown on the plan.
- Solid hand/person symbol; outline display not allowed.
- Overlaid hand/person symbols and countdown digits arranged side by side.
- Countdown digit display color: Portland Orange in accordance with ITE requirements.
- Countdown digits comprised of two seven segments, each in a figure 8 pattern.
- Photometric Requirements: Luminance, Uniformity, and Distribution in accordance with ITE requirements.
- Color Uniformity in accordance with ITE requirements.
- Blank-Out design; symbols and digits illegible even in direct sunlight when not illuminated.

Electrical

- Operating voltage: 89 VAC to 135 VAC.
- Low Voltage Turn-Off: 35 VAC.
- Turn-On and Turn-Off times in accordance with ITE specifications.
- Combined Hand – Countdown Digits wattage: ≥ 20 Watts.
- Input impedance at 60 Hertz sufficient to satisfy Malfunction Management Unit (MMU) requirements.
- Two separate power supplies. One to power the walking person symbol. One to power the hand symbol and the countdown digits.
- Meet Federal Communication Commission (FCC) regulations concerning electronic noise.
- Filtered and protected against electrical transients and surges.

Warranty

- Five years from date ownership is accepted.

Section M.16.07 F. Painting:

Third coat: Replace the first two sentences with the following:

All brackets and hardware shall be painted yellow by the manufacturer. The color shall be No. 13538, Federal Standard No. 595.

ITEM #1107011A – ACCESSIBLE PEDESTRIAN SIGNAL AND DETECTOR (TYPE A)

Description:

Furnish and install an Accessible Pedestrian Signal and Detector (APS&D). The APS&D provides audio and tactile information to augment the visual pedestrian signal.

Type A provides a low frequency percussive tone during the walk interval and is used where there is an exclusive pedestrian phase or ≥ 10 foot separation between APS&Ds.

Material:

A. General:

- Conform to applicable sections of the current MUTCD Chapter 4E, Pedestrian Control Features as specified herein.
- All features fully operational when the traffic signal is in colors mode.
- All features non-operational when the traffic signal is in flash mode.
- Interchangeable with a non-accessible type pedestrian pushbutton with no modifications to the Controller Assembly (CA) or Controller Unit.
- Audible transducer integral with the APS&D housing, adjacent to the pushbutton.
- Operation programming method: Either or combination of:
 - Mechanically by dip switches or circuit board jumpers
 - Infrared remote-control hand-held device

B. Electrical:

- Metallic components either grounded or insulated to preclude an electrical hazard to pedestrians under all weather conditions.
- All features powered by the 110VAC Walk signal and the 110VAC Don't Walk signal so that additional conductors from the CA are not needed.

D. Audible Pushbutton Locator Tone

- Frequency: repeating tone at one (1) second intervals
- Tone duration: ≤ 0.15 seconds
- Volume:
 - Minimum setting of zero
 - Manually adjustable initial setting
 - Automatically adjusted after initial setting. Volume increased in response to a temporary increase in ambient noise and subsequently decreased with a decrease in ambient noise.
 - Maximum volume: 100 dBA which is the approximate sound pressure of a gasoline powered lawn mower nearby.
 - Automatic volume adjustment independent of other APS&Ds at the intersection.
 - May be disabled without affecting operation of other features.
- Silent only during walk interval. Active all other times.

E. Vibrotactile Arrow Pushbutton

- Pushbutton contained in a circular assembly which fits inside the housing and is attached to the housing with 4 screws.
- ADA compliant: Size: ≥ 2.0 " (50) diameter, Actuation force: ≤ 5 ft-lb (22.2 N)

- Shape: Circular, raised slightly above housing so that it may be actuated with the back of a hand
- Tamper-proof, vandal-proof, weatherproof, freeze-proof, impact-resistant design and construction.
- Operation: Vibrates only during the walk interval (when the walk indication is displayed).
- Tactile Arrow:
 - Attached to surface of the button assembly by a tamperproof method.
 - Raised slightly above surface of pushbutton, minimum 0.125" (0.3)
 - Size: Length \geq 1.5" (38), Height \geq 1.0" (25)
 - Color: Sharp contrast to background color of pushbutton and housing

F. Audible Walk Interval

1. General:

- Operation independent of other APS&Ds at intersection.
- Active only during the walk interval (when the walk indication is displayed).
- Volume:
 - Minimum setting of zero
 - Manually adjustable initial setting
 - Automatically adjusted after initial setting. Volume increased in response to a temporary increase in ambient noise and subsequently decreased with a decrease in ambient noise.
 - Automatic volume adjustment independent of other APS&Ds at the intersection.
 - Maximum volume: 100 dBA which is the approximate sound pressure of a gasoline powered lawn mower nearby.
- Duration:
 - Default method: Automatically set by the duration of the visual walk signal display.
 - When selected: Manually set when rest-in-walk is used for a concurrent pedestrian movement.
- Audible sounds that mimic any bird call are not allowed.

2. Type A, Percussive Tone:

- Repeating tone at eight (8) to ten (10) ticks per second.
- Tone frequency: Multiple frequencies with a dominant component at 880 Hz which creates a "tick - tick - tick..." sound.

G. Pushbutton Housing/Sign Frame/Sign

- One piece die cast aluminum meeting requirements of ASTM B85.
- Sign frame designed to accept 9" x 12" (230 x 300) four-hole advisory sign.
- Flat back to facilitate surface mount.
- Available brackets to either pedestal top-mount or pole side-mount on pole diameter range of 3½" (89) to 15" (380).
- Available brackets to allow mounting two (2) APS&Ds to the same 3½" (89) pole, facing \geq 60 degrees apart, at the same height.
- Wire entrance through the rear.
- Stainless steel mounting hardware.
- Color: The color shall be yellow No. 13538, Federal Standard No. 595. At intersections at Merritt Parkway interchanges, all brackets and hardware shall be painted dark green by the manufacturer. The color shall be No. 14056, Federal Standard No. 595.
- Finish: Housing/Frame and all mounting brackets either:
 1. Painted with 3 coats of infrared oven-baked paint before assembly.
 - Primer: Baked iron oxide which meets or exceeds FS TT-P-636.

- Second coat: Exterior-baking enamel, light gray, which meets or exceeds FS TT-E-527.
 - Third coat: Exterior-baking enamel, which meets or exceeds FS TT-E-489.
- 2. Electrostatic powder coated after chemically cleaned.
- Sign: CT DOT Sign No. 31-0845

Construction Methods:

Install the APS&D according to the manufacturer's instructions. Position the APS&D so the plane of the sign face is parallel to the crossing (sign is facing perpendicular) and the arrow is pointing in the same direction as the crossing, not necessarily at the ramp. Notify the Engineer if there is any discrepancy or ambiguity between the plans and field conditions that prevent placement of the APS&D as shown on the plan. Set the minimum sound levels of the locator tone and the audible walk indication when there is little or no ambient noise as in night time operation. Set the volume of audible walk indications and pushbutton locator tones to a maximum of 5dBA louder than ambient sound. The locator tone should be audible 6' to 12' (1.8 m to 3.6 m) from the pushbutton or to the building line, whichever is less. Confirm the volume of both audible walk indication and the locator tone increases with an increase in ambient sound and subsequently decreases when the ambient noise decreases.

If programming method is remote, by an infrared hand-held device, provide one device and operation manual for each intersection where APS&D is installed.

Method of Measurement:

This work is measured by the number of APS&Ds of the type specified, installed, tested, fully operational, and accepted.

Basis of Payment:

Payment for this work is based on the installation, inspection, successful completion of the 30 day test period, and final acceptance of the Accessible Pedestrian Signal and Detector of the type specified. Payment includes the sign, mounting brackets for adjacent buttons on the same structure, all incidental materials, labor, tools, and equipment necessary to complete the installation. Payment also includes the warrantee, installation manual, and operation manual.

If programming method is remote by an infrared hand-held device, the total bid price of all APS&Ds includes one remote programming device and accompanying operation manual for each intersection where APS&D is installed.

Pay Item	Pay Unit
Accessible Pedestrian Signal and Detector (Type A)	Each

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ITEM #1108115A – FULL ACTUATED CONTROLLER 8 PHASE

Article 11.08.01 - Description: Delete the second paragraph and replace with the following:

This item shall consist of furnishing and installing an actuated controller, which shall be a completely digital solid state unit, for controlling the operation of the traffic signals.

The controller shall be completely furnished with the number of phases called for in the item. The cabinet to house the controller shall be completely wired and all sub-bases shall be complete with load switches and flash relays as specified in the **Functional Specifications For Traffic Control Equipment**. The cabinet shall also have all necessary auxiliary equipment required to provide the sequence and timing indicated on the plans. A time switch shall be installed in each cabinet.

Article 11.08.03 – Construction Methods: Delete the entire second paragraph.

Article M.16.09 - Controllers: Add the following sub-articles:

2. Actuated Controllers: The purpose of this sub-article is to set forth minimum design and operating requirements for the materials and components for a digitally timed actuated controller.

The Connecticut Department of Transportation Functional Specifications for Traffic Control Equipment, current edition governs the material for the Controller Assembly. The Functional Specifications are advertised biennial for vendors to provide equipment to the State on a low bid basis. All underlined text indicates an addition or revision to these specifications from the previous version. The Functional Specifications are available on the Departments website.

The following sections of the **Notice to Bidders**, pages 1 - 10, shall apply to contract supplied traffic controllers: 12, 15, 16, 17, 18, & 19.

Item 1108115A – FULL ACTUATED CONTROLLER 8 PHASE shall conform to the requirements of Section 1, pages 11 – 94. The Controller Unit (CU) shall conform to the requirements of Item 1D1, CONTROLLER (PRE-EMPTION TYPE), pages 29 – 31. All cabinets shall conform to the specifications of the “D” CABINET REQUIREMENTS, pages 78 – 84.

Controllers in a closed loop system shall conform to the requirements of Section 27, INTERNAL CLOSED LOOP SYSTEM FOR EXISTING NAZTEC SYSTEM, pages 162 – 185, in addition to the above requirements.

The solid state time switch shall conform to Section 13. FOUR CIRCUIT SOLID STATE TIME CLOCK WITH TIME BASE COORDINATION OPTION TC/TBC, pages 140 - 143.

Traffic signal equipment which has not been previously approved to meet the requirements of the Functional Specifications for the above items, will not be approved for use on this contract.

Several parts of Item 1 of the Functional Specifications do not apply to contract supplied and developer supplied traffic controllers. The specifications which are to be disregarded are listed below.

- Item 1A-1 - Controller, Two Phase Microprocessor Keyboard Entry
- Type 6 Conflict Monitor
- Item 1A-2 - Two Phase Type "A" Cabinet

Supplemental specifications listed below, have been added for material and controller operations which the Department of Transportation does not include in the Functional Specifications for Traffic Control Equipment.

- U.C.F. Time Switch Flash Command Procedure
- Time Clock/Time Base Installation Requirements
- 24 Volt Relay Type A
- 110 Volt Relay Type F
- Type G
- Time Delay Relay
- Non-Actuated Advance Green Phase
- Actuated Advance Green Phase
- Non-Actuated Clearance / Lag Green Phase
- Actuated Clearance / Lag Green Phase
- Flashing Stop Ahead Sign
- Max II Actuation By Pedestrian Call

UNIFORM CODE FLASH COMMAND PROCEDURE

1. Activate the **MINIMUM RECALL** input to the controller to ensure cycling prior to transferring to flashing operation.
2. Omit all non-actuated and actuated artery advance phases.
3. Omit phases 1 & 5 of all quad sequences.
4. Activate the **STOP TIME** input to the controller, upon entering flash, to prevent cycling.
5. Transfer to flash at the end of the last side street all red condition (at the point the artery **ON** output becomes active).
6. Special technical notes on the intersection plan supercede the above requirements.

TC/TBC INSTALLATION REQUIREMENTS

The following requirements are to be observed when engineering the installation of TC/TBC:

1.
 - a. Circuit 1 shall be designated FLASH and be reserved for night flash command.
 - b. Circuit 2 shall be designated MAX 2 and be reserved for Max 2 command.
 - c. Circuit 3 shall be designated COORD and shall select coordinated operation of the intersection.
 - d. Circuit 4 shall be the yield, and force off command to the controller.
2. All clock outputs shall be active to select the function specified. For example; If the TC/TBC were removed for repair, no inputs would be applied to the controller. The intersection will then operate non-coordinated, in Max 1. Programming the TC/TBC without cycle and offset is not an acceptable method to create a non-coordinated operation. Refer to the typical hookup diagram.
3. All TC/TBC clock installations shall be wired as detailed in figure 1. This method is used for both full and semi actuated operation.
4. Midnight resync shall occur at 12:00 AM.
5. A program card shall be completed indicating all input steps and settings. Four copies shall be provided. One copy left in the cabinet. Three delivered to the engineer along with the cabinet wiring diagrams.

TIME CLOCK / TIME BASE COORDINATION

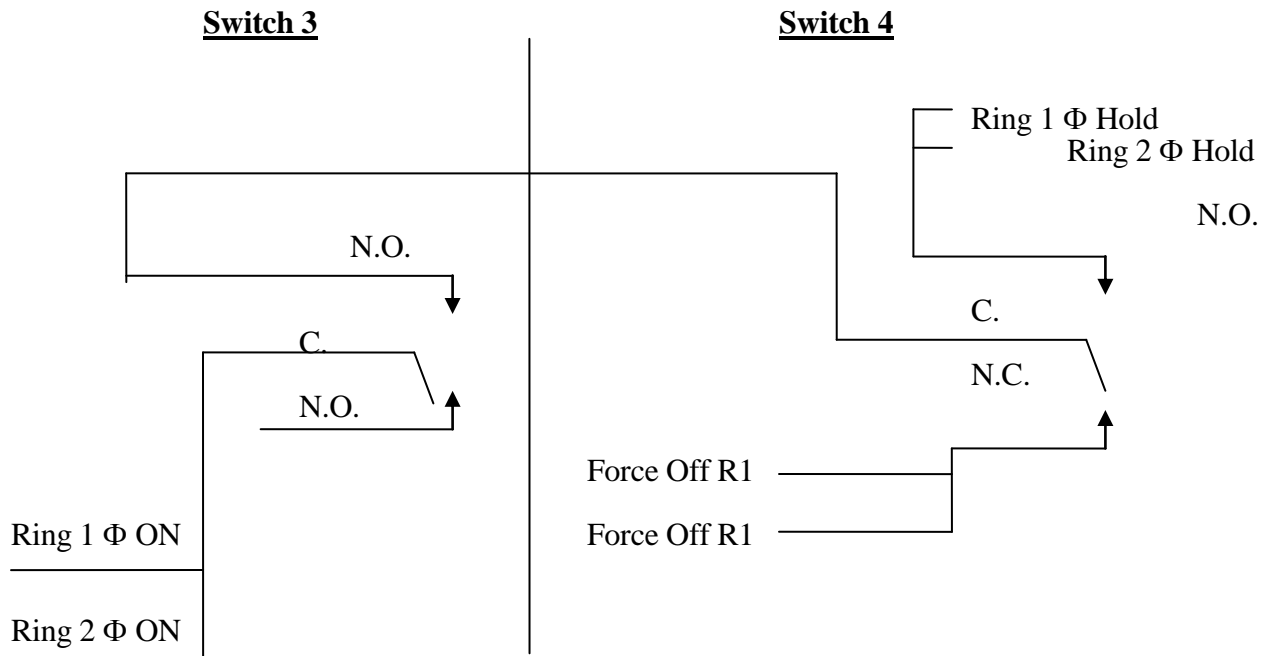


FIG. 1

24 VOLT RELAY

All 24 Volt relays shall meet the requirements of one of the following two types. Diodes shall be installed across the coils of all direct current relays to shunt the reverse voltage generated when the coil de-energizes. All diodes shall be general purpose ECG 125 1000prv @ 25A or equivalent, rated at least .5 amp forward biased. Diodes shall be external to the relay, not enclosed in the dust cover.

TYPE A: Midland Ross, Midtex 155-92 or equivalent.

DESCRIPTION:

This relay shall be enclosed in a clear polycarbonate removable dust cover. It shall have a mechanical life of more than 100,000 operations at rated load.

CONTACTS:

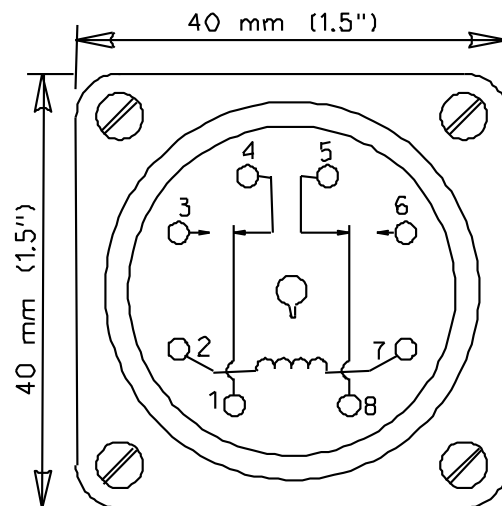
The contacts shall be 2 form C (D.P.D.T), U.L. rated at 5 amps 120 volts A.C. The contacts shall be pure fine silver (gold flash). There shall be no tungsten (lamp) load on the contacts of this relay.

COIL: The coil shall operate on 24 V.D.C. and have no less than 450 OHMS impedance.

SIZE: The relay shall be no larger than 65mm(2.5") H x 40mm(1.5") L x 40mm(1.5") W.

BASE: This relay shall have an eight pin octal plug-in base with the pin designation shown below:

1. Common (1)
2. Coil
3. Normally open (1)
4. Normally closed (1)
5. N.C. (2)
6. N.O. (2)
7. Coil (2)
8. Comm.



Bottom View And Wiring Diagram

SOCKET: The socket shall be a closed back, screw terminal type. The front mounted screws shall be 6-32 capable of accepting #14 AWG wire.

110 VOLT RELAY

All 110 volt relays shall meet the requirements of one of the following two types. Across the coil of each relay there shall be a molded suppressor rated at .1uf - 47 ohm @ 600V to suppress electrical noise created by the energization / de-energization of the relay.

TYPE F: Midland Ross, Midtex 136-62T3A1 or equivalent

DESCRIPTION:

Relays of this type shall function as flash transfer, power switching and signal drive. Other uses are acceptable, however, type G relays cannot be used for the above applications.

CONTACTS:

The contacts shall be in the D.P.D.T. form and consist of 10mm(3/8") diameter silver cadmium oxide, rated at 20 Amps @ 117 VAC resistive.

COIL:

The coil shall operate on 110 VAC. No semi-conductors will be allowed in the coil circuit of this relay.

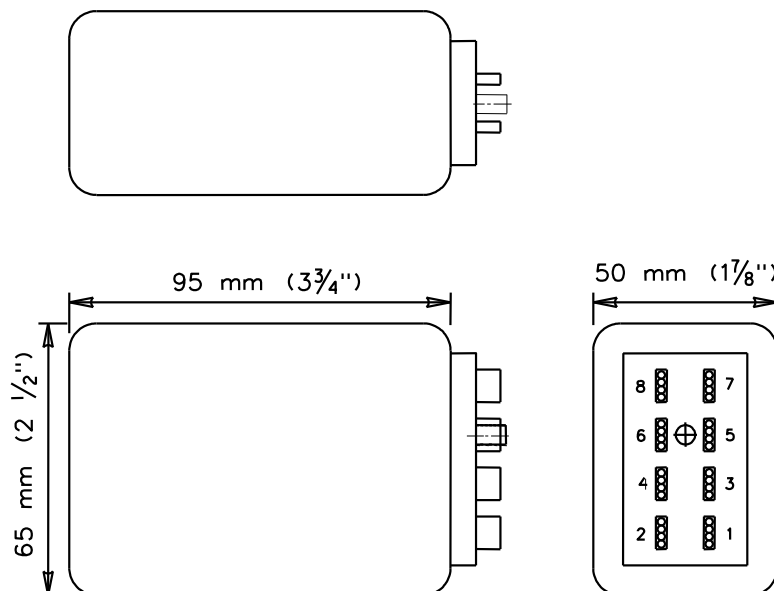
SIZE:

The relay shall be enclosed in a clear plastic dust cover. The overall dimensions shall be no larger than 63mm(2 1/2") x 94mm(3 3/4") x 47mm(1 7/8") as illustrated below.

BASE:

This relay shall have an eight blade plug-in base, Ventron Beau Plug P-5408 or equivalent with the pin designations as shown below:

1. Coil
2. Coil
3. N.C. 1
4. N.C. 2
5. Comm. 1
6. Comm. 2
7. N.O. 1
8. N.O. 2



SOCKET:

The socket shall be Ventron Beau Plug S-5408 or equivalent, contacts rated at 15 Amps @ 1750 VRMS.

TYPE G: Magnecraft, W 88 ACXP-8 or equivalent

DESCRIPTION:

Relays of this type shall function in low current switching applications such as interconnect interface or pre-emption circuits. A clear polycarbonate plastic enclosure shall cover the relay mechanism.

CONTACTS:

The contacts shall be in the D.P.D.T. form and consist of 5mm (3/16") diameter gold flashed, silver alloy, rated at 10 Amps @ 120 VAC resistive.

COIL:

The coil shall operate on 120 Volts AC and require a nominal 3 VA.

SIZE:

Height, length and width dimensions shall be the same as the 24 volt relay Type A: 35mm (1 3/8") x 60mm (2 3/8") x 35mm (1 3/8").

BASE:

The base shall be an octal plug with the pin designations the same as the 24 volt relay Type A.

SOCKET:

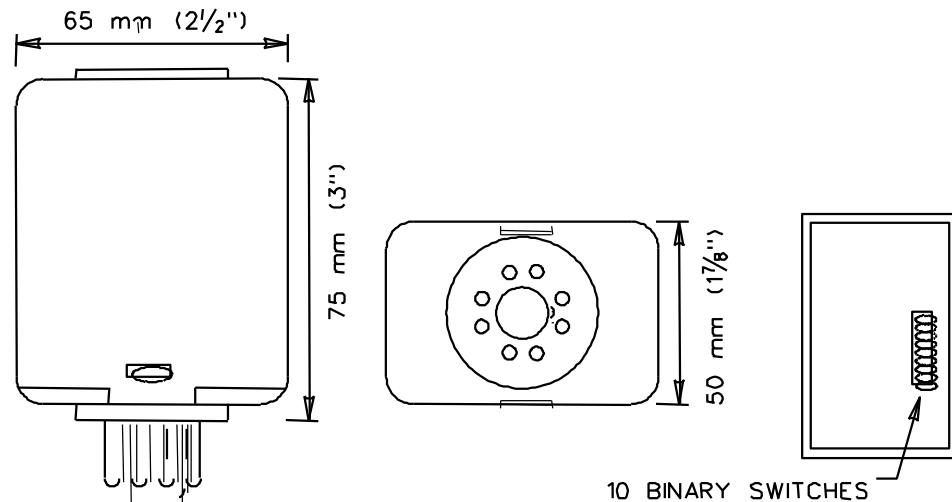
The socket shall be the same as that for the 24 volt relay Type A.

TIME DELAY RELAY

120 VAC SSAC TDM120A or equivalent
 24 VDC SSAC TDM24DL or equivalent

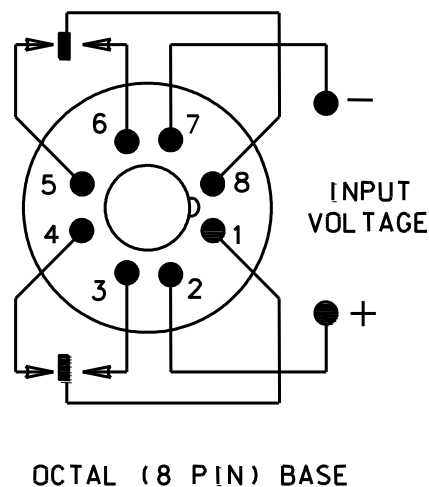
DESCRIPTION:

The time delay relays shall be self enclosed, plug-in, delay on operate type. They shall be digitally timed and adjustable by the use of dip switches located on the top of the case. The timing range shall be 1 to 1023 seconds in 1 second intervals. The time delay relays shall have an internal double pole double throw relay with form "C" contacts rated at 10 amps 120 volts AC. They shall operate accurately in a temperature range of -20 to +65 degrees C. A 120 volt AC input shall initiate timing of the 120 VAC TDR and a 24 VDC input shall initiate timing of the 24 VDC TDR. Removal of the input voltage shall reset the timer. Maximum dimensions of the case shall be as shown below.



SOCKET:

The socket shall be a standard octal base (8 pin) with screw terminal connectors. The pin designation shall be as shown below.



NON-ACTUATED ADVANCE GREEN PHASE

Where the timing and sequence indicates an advance green phase that always precedes the phase in recall (usually phase 2), and that either is fixed timed or is to be extended only, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to the advance phase OMIT input.
2. If the advance phase is to be extendable, it shall be in minimum recall. If the advance phase is fixed timed, it shall be in maximum recall. A different advance time may be selected by switching to maximum 2.

Example: Phase 1 is the advance phase (extendable), in minimum recall.
 Phase 2 is the artery, in recall.
 Phase 4 is the minor street, in non-lock.

Phase 2 ON ---|←--- Phase 1 OMIT

Where the timing and sequence indicates an advance phase that is fixed timed (not extendable), and that always precedes either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The recall phase (usually Phase 2) ON output shall be diode connected to the advance phase's, parent phase OMIT input.
2. The parent phase CHECK output shall be diode connected to the advance phase vehicle detector input.
3. The advance phase ON output shall be diode connected to the following parent phase vehicle detector input. This is to insure a green indication on the parent phase.
4. The advance phase shall be in the non-lock mode. The advance time shall be selected from the maximum interval.

Example: Phase 2 is the artery, in recall.
 Phase 3 is the advance for phase 4, in non-lock mode.
 Phase 4 (parent phase) is the minor street, in non-lock mode.

Phase 2 ON ---|←--- Phase 4 OMIT

Phase 4 CHECK ---|←--- Phase 3 vehicle detector

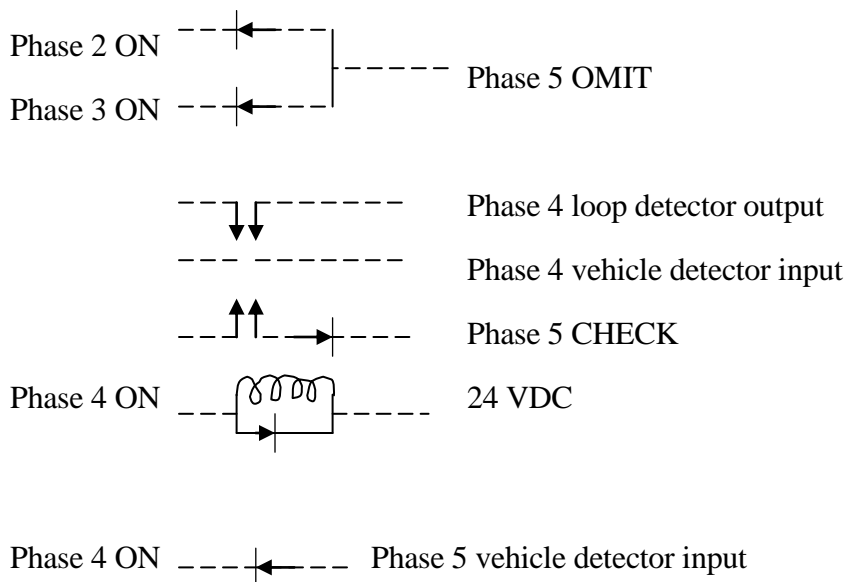
Phase 3 ON ---|←--- Phase 4 vehicle detector

ACTUATED ADVANCE GREEN

Where the timing and sequence indicates an advance green phase that is to be extended only, and is to always precede either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The phase ON outputs of all phases that could precede the advance phase, shall be diode connected to the parent phase OMIT input.
2. The parent phase CHECK output shall be diode connected, through the normally closed contacts of a relay, to the advance phase vehicle detector input. The advance phase loop detector output shall be connected to the normally open contacts.
3. The relay coil shall be energized by the advance phase ON output, which in turn will switch the vehicle detector input from the parent phase CHECK circuit to the loop detector.
4. The advance phase ON output shall be diode connected to the following parent phase vehicle detector input. This is to insure a green indication from the parent phase.
5. The advance phase shall be in the non-lock mode.

Example: Phase 2 is the artery, in recall.
 Phase 3 is the pedestrian phase.
 Phase 4 is the advance for phase 5, in non-lock.
 Phase 5 (parent phase) is the minor street, in non-lock.



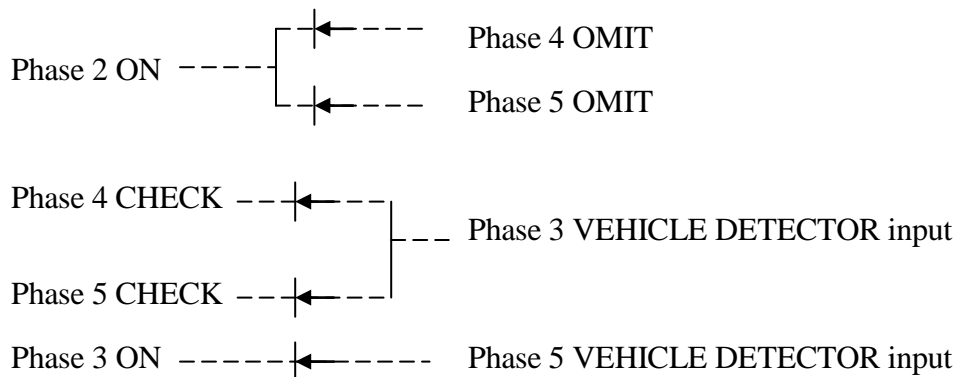
The 24 volt relay shall be Type C as previously described in these specifications.

NON-ACTUATED CLEARANCE PHASE**NON-ACTUATED LAG GREEN PHASE**

Where the timing and sequence indicates a non-actuated clearance phase or a lagging green phase that always follows the phase in recall, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to all appropriate phase OMIT inputs except the clearance phase.
2. The remaining actuated phases shall have their CHECK outputs diode connected to the clearance phase vehicle detector input.
3. The clearance phase ON output shall be diode connected to the following phases vehicle detector input (if the phase is in non-lock mode). This will prevent the controller from returning to the parent phase from the clearance phase without servicing the minor street.
4. The clearance phase shall be in the non-lock mode.
5. The clearance, or lag green time shall be selected from the maximum interval.

Example: Phase 2 is the artery, in recall.
 Phase 3 is the clearance phase, in non-lock.
 Phase 4 is the pedestrian phase.
 Phase 5 is the minor street, in non-lock.



Where the timing and sequence shows a non-actuated clearance phase or lagging green phase following either a phase other than phase 2 or a phase not in recall, the following guidelines shall be in effect:

1. The parent phase ON output shall be diode connected to the following clearance phase vehicle detector input. This insures the clearance phase will always follow the parent phase.
2. The clearance phase shall be in the non-lock mode.
3. The clearance, or lag green time shall be selected from the minimum green interval.

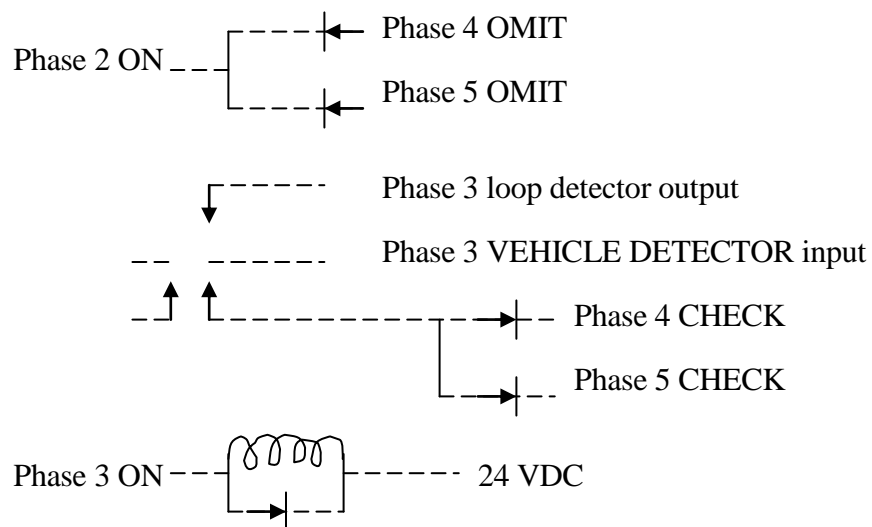
Parent phase ON ---|<--- Clearance phase VEHICLE DETECTOR input

ACTUATED CLEARANCE PHASE**ACTUATED LAG GREEN PHASE**

Where the timing and sequence indicates an actuated lagging green phase that is to be extended only, and always follows another phase, the following guidelines shall be in effect:

1. The parent phase (usually phase 2) ON output shall be diode connected to the phase OMIT inputs of all phases that could follow the lag phase.
2. The CHECK outputs of all phases that could follow the lag phase shall be diode connected, through the normally closed contacts of a relay, to the lag phase vehicle detector input. The lag phase loop detector output shall be connected to the normally open contacts.
3. The relay coil shall be energized by the lag phase ON output which in turn will switch the phase detector input from the CHECK circuits to the loop detector.
4. The lag phase shall be in the non-lock mode.

Example: Phase 2 (parent phase) is the artery, in recall.
 Phase 3 is the lag phase, in non-lock.
 Phase 4 is the pedestrian phase.
 Phase 5 is the minor street, in non-lock.



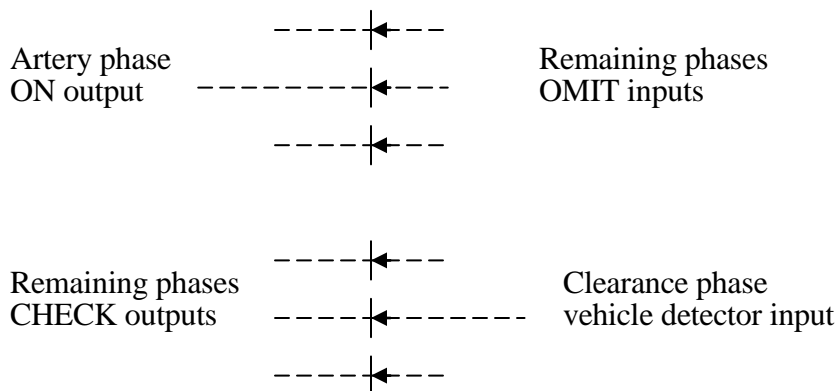
The 24 VDC relay shall be Type C as previously described in these specifications.

FLASHING STOP AHEAD SIGN

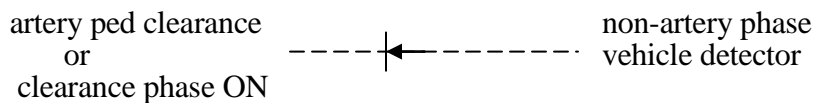
Where the timing and sequence indicates a flashing stop ahead sign, the clearance interval following the phase that the sign is off shall be timed by the following method.

The following phase shall be used for the clearance time. These phases shall be overlapped. The green indication will be maintained by the overlap feature and the following phase green time will be the stop ahead sign clearance.

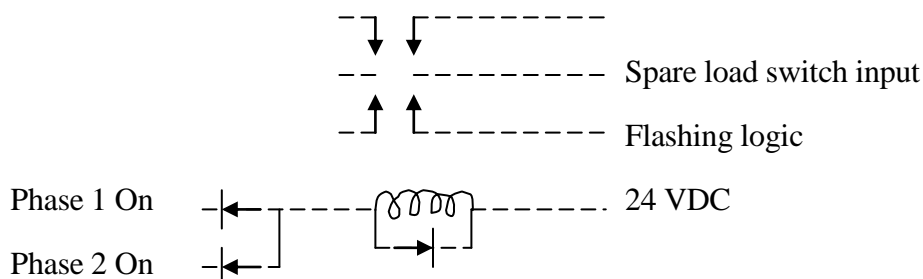
The artery phase ON output shall be diode connected to all other phase OMIT inputs except the clearance phase and the artery phase. The CHECK outputs from the remaining phases (as needed) shall be diode connected to the sign clearance phase vehicle detector input. The clearance phase shall be in the non-lock mode.



If the non-artery phases are in the non-lock mode, a call must be forced to the non-artery phase once the controller leaves the artery Hold interval (either artery walk or artery green). This prevents a false "Stop Ahead" indication if a vehicle turns right on red during the flashing sign clearance interval.



Unless otherwise shown on the plans, the 110 VAC flash power shall be from a spare load switch in the controller cabinet. The load switch input shall be driven with the flashing logic output from the controller. The flashing logic output shall be disconnected from the load switch during the intervals the sign is inactive.



Typical drive circuit for "WHEN FLASHING STOP AHEAD" sign

TIME BASE COORDINATION

MAX II ACTUATION BY PEDESTRIAN CALL

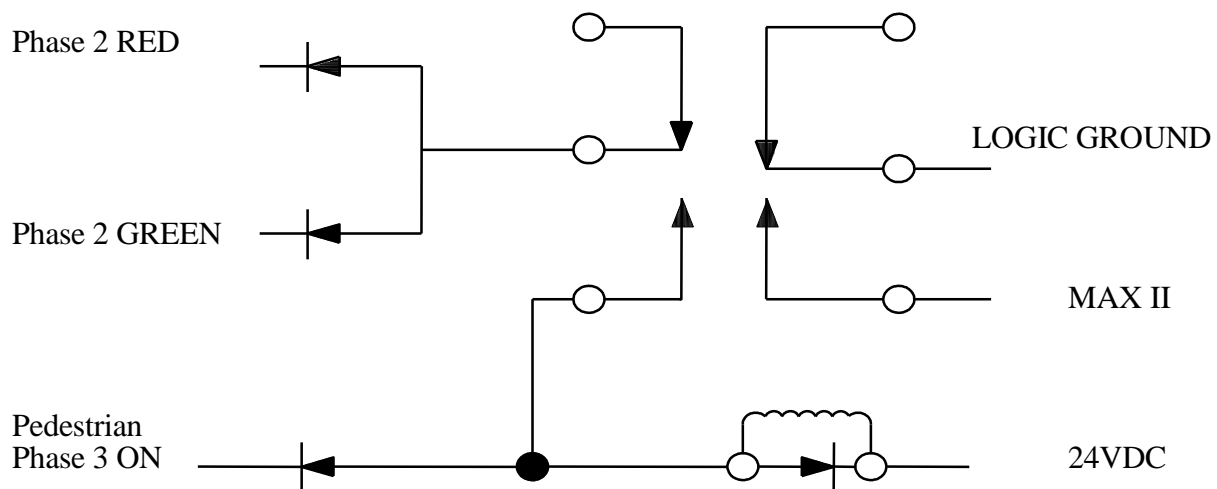
When the sum of the split times, including the walk and don't walk, exceed the background cycle length, the designer may choose to either allow a double cycle of the background timer or reduce the phase timings when the ped phase is called. Reduction of the phase timing by switching to MAX 2 avoids double cycling.

Where indicated on the plans the exclusive pedestrian phase will call MAX II. The minor movement max 2 times are set low so that the total phase times do not exceed the coordination cycle length.

Install a 24 volt relay connected to the inputs and outputs as shown on the following schematic.

Operation: When the controller advances to the exclusive pedestrian phase, the relay is actuated and latched. MAX II timing is selected for one complete cycle, until the relay is unlatched by the artery yellow (absence of red or green).

Example: Phase 2 is the artery. Phase 3 is the exclusive pedestrian phase.



ITEM #1108724A – PHASE SELECTOR

ITEM #1112410A – DETECTOR (TYPE A)

ITEM #1112470A – PRE-EMPTION SYSTEM CHASSIS

ITEM #1113550A – DETECTOR CABLE (OPTICAL)

SYSTEM DESCRIPTION:

The emergency vehicle traffic signal priority control system shall enable designated vehicles to remotely cause the traffic signal controller to advance to and/or hold a desired traffic signal display by using existing controller functions. The control shall be activated at a minimum distance of 1,800 feet (548.6m) along an unobstructed "line of sight" path. The control shall not terminate until the vehicle is within 40 feet (12.2m) of the detector or at the intersection.

The system shall consist of the following components:

- A. Vehicle Emitter which shall be mounted on the emergency vehicle and shall transmit optical energy signals only in the forward direction. If the municipality presently uses optical pre-emption, the emitters shall be of the same manufacture currently used by the Town.
- B. Phase Selector (minimum 2 channel) which shall cause the signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle. A pre-emption system chassis shall house two phase selectors.
- C. Optical Detector which shall be mounted on or near a traffic signal and shall receive the optical energy signals generated by the Vehicle Emitter.

Detector (Type A), 1 Direction, 1 Channel

- D. Detector Cable (Optical).

System Operation:

- A. The operating sequence shall be initiated when the optical detector receives the required optical energy signal from the Emitter.
- B. The phase selector shall cause the traffic signal controller to advance to and/or hold the desired traffic signal display for the emergency vehicle.
- C. The phase selector shall cause the controller to advance to and/or hold the desired traffic signal display even if the optical energy signals cease before the desired display is obtained.

- D. The phase selector shall allow the traffic signal controller to resume normal operation within ten seconds after optical energy signals cease if the optical energy signals cease after the desired traffic signal display is obtained.
- E. The phase selector shall not respond to optical energy signals from an emergency vehicle if it is already processing optical energy signals from another emergency vehicle.

System Components:

A. Vehicle Emitter:

The emitter assembly consists of an emitter and power supply and an emitter control switch assembly. The emitter assembly is mounted on a vehicle and produces a flashing optical signal when in operation.

- 1. Shall operate on ten to fifteen volts DC input voltage, but shall not be damaged by input voltage surges up to twenty-five volts DC.
- 2. Shall be controlled by a single on/off switch that requires no other adjustments by the operator. The on/off condition shall be indicated by a light located adjacent to the switch.
- 3. Shall be automatically disabled or de-activated by one or a combination of the following: seat switch, emergency brake switch, door switch, transmission safety switch.
- 4. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 165⁰ F. (minus 34⁰ C to plus 74⁰ C)
- 5. Shall operate in 5 to 95 % humidity.
- 6. Shall be a pulsed optical energy source with a controlled repetition rate of 10Hz to 14 Hz and adjustable intensity.
- 7. Shall not generate voltage transients on the battery input line which exceed battery voltage by more than four volts.
- 8. Shall produce optical energy in a cone of not more than 90 degrees horizontal and not more than 30 degrees vertical. The detectors and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

B. Optical Detector:

The optical detector receives the high intensity optical pulses produced by the emitter. These optical energy pulses are transformed by the detector into appropriate electrical signals which are transmitted to the phase selector. The optical detector is mounted at or near the intersection in a location which permits an unobstructed line of sight to vehicular approaches. The units may be mounted on signal span wires, mast arms or other appropriate structures.

1. Shall be of solid state construction.
9. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 165⁰ F.
(minus 34⁰ C to plus 74⁰ C)
2. Shall have internal circuitry potted in a semi-flexible compound to ensure moisture resistance.
3. Shall operate in 5 to 95 % humidity.
4. Shall have a cone of detection of not more than 13 degrees. The detector and/or phase selector shall not sense a pre-emption signal from an emitter outside this cone.

C. Phase Selector:

The phase selector supplies power to and receives electrical signals from the optical detector. When detector signals are recognized as a valid call, the phase selector causes the signal controller to advance to and/or hold the desired traffic signal display. This is accomplished by activating the pre-empt input to the controller.

The phase selector is capable of assigning priority traffic movement to one of two channels on a first-come, first-serve basis. Each channel is connected to select a particular traffic movement from those normally available within the controller. Once a call is recognized, "commit to green" circuitry in the phase selector functions so that the desired green indication will be obtained even if optical communication is lost. After serving a priority traffic demand, the phase selector will release the controller to follow normal sequence operation.

1. Shall include an internal power supply to supply power to the optical detectors.
2. Shall have minimum two-channel operation with the capability of interfacing with an additional phase selector for expansion of channels of operation.
3. Shall have adjustable detector range controls for each channel of operation, from 40 feet (12m) to 1800 feet (548m).
4. Shall have solid state indicator lights for power on and channel called.
5. Shall operate over an ambient temperature range of minus 30⁰ F. to plus 165⁰ F.
(minus 34⁰ C to plus 74⁰ C)
6. Shall operate in 5 to 95 % humidity.

D. Pre -Emption System Chassis:

1. Card cage/slot shall provide all the necessary hardware and harnessing required to allow simple wiring of phase selector to detector outputs and controller inputs..
2. Shall have harness to carry 115VAC and card outputs.
3. Shall include terminal block/strip for connecting the detectors.

E. Detector Cable (Optical):

1. 3-Conductor cable with shield and ground wire.
2. AWG #20 (7x28) stranded.
3. Individually tinned copper strands.
4. Conductor insulation: 600 volt, 167^o F. (75 deg. C).
5. 1 Conductor-yellow; 1 Conductor-blue; 1 Conductor-orange.
6. Aluminized mylar shield tape or equivalent.
7. AWG #20 (7x28) stranded uninsulated drain wire
8. DC resistance not to exceed 11.0 ohms per 1000 feet (305m).
9. Capacitance from one conductor to other two conductors and shield not to exceed 48 pf/ft. (157pf/m).
10. Jacket: 600 volts, 176^o F. (80 deg. C), minimum average wall thickness – 0.045” (1.14mm).
11. Finished O.D.: 0.3” (7.62mm) max.

System Interface:

System shall be capable of operating in a computerized traffic management system when appropriate interfacing is provided by the computer supplier.

General:

The Contractor shall furnish the manufacturer the phasing diagrams indicating controller sequence and timing.

The Contractor shall secure from the manufacturer a guarantee for the equipment for a period of sixty (60) months, which time shall commence from the date of delivery. Manufacturer shall certify upon request that all materials furnished will conform to this specification. The manufacturer or his designated representative shall be responsible for determining and setting all required range and emitter intensity for the emergency vehicle operation.

Construction Methods:

All equipment except the vehicle emitter assembly shall be installed and wired in a neat and orderly manner in conformance with the manufacturers' instructions. The vehicle emitter assembly shall be delivered to a designated town representative. Installation of the vehicle emitter assembly shall be the responsibility of the town.

Traffic signals owned and maintained by the State that have optical pre-emption equipment owned and maintained by the town shall have an Auxiliary Equipment Cabinet (AEC) attached to the controller cabinet. The optical pre-emption equipment shall be housed in the AEC. Traffic signals owned and maintained by the town do not require an AEC to house the pre-emption equipment.

Detector cables shall be continuous with no splices between the optical detector and the AEC.

Detector locations shown on the plan are for illustration purposes only. Exact location shall be determined by the contractor or the designated representative for the best possible line of sight.

If not present in an existing traffic controller cabinet, the following items shall be installed and connected, in conformance with the current Functional Specifications for Traffic Control Equipment, “D” Cabinet Requirements (Pre-emption Type):

- Controller “D” harness and adapter.
- Pre-emption termination panel with terminal block and relay bases.
- Pre-emption disconnect switch, mounted on the emergency switch panel (on inside of cabinet door).
- Pre-emption test buttons, mounted on the pre-emption termination panel.

All connections from the phase selector to the “D” harness and to the cabinet wiring shall be made at the termination panel. The termination panel shall have AC+ Lights, AC-, and a switched logic ground. The switched logic ground feeds all the pre-empt inputs to the phase selector. When switched off by the pre-emption disconnect switch, the traffic controller shall not be affected by pre-empt calls from the optical pre-emption system. A minimum of two test buttons shall be provided. If there are more than two pre-empt runs, a button for each shall be installed. A chart or print out indicating the program steps and settings shall be provided along with the revised cabinet wiring diagrams.

Test the Pre-emption System at the semi-final inspection According to the following Guidelines:

1. Notify the system owner/user, such as the municipal fire chief or public works director, of the scheduled inspection
2. Request a fire department representative and an emergency vehicle, which has an emitter to conduct the test. If not available, the contractor shall provide an emitter.
3. In the presence of the Engineer and the municipal representative, test each pre-empted approach with the emergency vehicle. Test the following items of the system:
 - * Confirm that the emitter activates the phase selector and the phase selector activates the correct pre-emption input to the controller.
 - * Confirm adequate range. The traffic signal must be pre-empted to green sufficiently in advance of the emergency vehicle arrival. The vehicle emitter shall initiate pre-emption at a minimum distance of 1800 FT. (548.6m).
 - * Confirm there are no false calls. Keep the emitter active as the emergency vehicle passes through the intersection. No other optical detectors shall sense the strobe.
4. Document the test. Provide the Engineer and, upon request, the municipality copies of the test results.

If a malfunction is found or the system needs adjustment (such as range, emitter intensity, or detector location), schedule a follow-up test. Repeat the above steps for all approaches that did not pass.

All adjustments such as emitter intensity, phase selector range, sensitivity, detector placement, shall be made at the intersection by the contractor so that the optical pre-

emption operates correctly with other major manufacturers' equipment currently owned by the town.

Method of Measurement:

Optical Detectors, Phase Selectors, System Chassis will be measured for payment by the number of each supplied, installed and accepted. Detector Cable (Optical) will be measured by the number of linear feet (meters) supplied, installed and accepted. Vehicle Emitters will be measured by the number of each supplied to the Town and accepted.

Basis of Payment:

Payment for Optical Detectors, Phase Selector, System Chassis and Detector Cable (Optical) will include the item unit cost, including all manufacturer's required mounting hardware and the cost of installation and supervision by the manufacturer or his designated representative, including travel and subsistence, and all materials, equipment and labor incidental thereto. Payment for termination panel, "D" harness, test buttons, program chart (or print out) and revised cabinet wiring diagrams shall be included in the item PRE-EMPTION SYSTEM CHASSIS. Payment for Vehicle Emitters will include the item unit cost only.

<u>Pay Items</u>	<u>Pay Units</u>
Detector (TYPE A)	Ea.
Phase Selector	Ea.
Detector Cable (Optical)	L.F. (m)
Pre-Emption System Chassis	Ea.

ITEM #1111201A – TEMPORARY DETECTION (SITE NO. 1)

Description:

Provide a Temporary Detection (TD) system at signalized intersections throughout the duration of construction, as noted on the contract plans or directed by the Engineer. TD is intended to provide an efficient traffic-responsive operation which will reduce unused time for motorists travelling through the intersection. A TD system shall consist of all material, such as pedestrian pushbutton, conduit, handholes, cable, messenger, sawcut, loop amplifier, microwave detector, Video Image Detection System (VIDS), Self-Powered Vehicle Detector (SPVD), etc. that is needed to achieve an actuated traffic signal operation.

Materials:

Material used for TD is either owned by the Contractor that is in good working condition or existing material that will be removed upon completion of the contract. Approval by the Engineer is needed prior to using existing material that will be incorporated into the permanent installation. New material that will become part of the permanent installation is not included or paid for under TD.

Construction Methods:

This item includes furnishing, installation, relocating, realigning, and maintaining the necessary detection systems as to provide vehicle detection during each phase of construction. If not shown on the plan, program the TD modes (pulse or presence) as the existing detectors or as directed by the Engineer. If the TD method (loops [saw cut or preformed], SPVD, microwave, VIDS, or other) is not shown on the contract plan it may be the Contractor's choice. The method chosen for TD must be indicated on the TD Plan submission.

The traffic signal plan-of-record, if not in the controller cabinet will be provided upon request. Ensure the controller phase mode (recall, lock, non-lock) and phase timing are correct for the TD. Adjust these settings as needed or as directed by the Engineer.

At least 30 days prior to implementation of each phase of construction submit a TD proposal to the Engineer for approval. Submit the TD proposal at the same time as the Temporary Signalization plan. Indicate the following information for each intersection approach:

- Phase Mode
- Temporary Detection Method
- Area of Detection
- Detector Mode

Submit the proposed temporary phase timing settings and the TD installation schedule with the TD proposal. See the example below.

Example Proposed Temporary Detection and Timing

Site 1

Warren, Rt. 45 at Rt. 341, Location #149-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 45 NB</i>	<i>2</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 45 SB</i>	<i>2</i>	<i>Min Recall</i>	<i>SPVD</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Microwave</i>	<i>30' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>2</i>	<i>20</i>	<i>0</i>	<i>0</i>	<i>6</i>	<i>45</i>	<i>60</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011***Site 2**

Scotland, Rt. 14 at Rt. 97, Location #123-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 15 WB Left Turn</i>	<i>1</i>	<i>Non-Lock</i>	<i>VIDS</i>	<i>5' in front to 10' Behind Stop Bar</i>	<i>Presence</i>
<i>Rt. 14 EB</i>	<i>2</i>	<i>Min Recall</i>	<i>Existing Loop</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 14 WB</i>	<i>6</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 97</i>	<i>4</i>	<i>Lock</i>	<i>Loop, Pre- formed</i>	<i>20' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>1</i>	<i>5</i>	<i>0</i>	<i>0</i>	<i>2</i>	<i>12</i>	<i>18</i>	<i>3</i>	<i>0</i>
<i>2 & 6</i>	<i>24</i>	<i>0</i>	<i>4</i>	<i>4</i>	<i>26</i>	<i>36</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011*

When at any time during construction the existing vehicle detection becomes damaged, removed, or disconnected, install TD to actuate the affected approaches. Install TD sensors and make operational prior to removing existing detection. TD must be operational throughout all construction phases.

Provide to the Engineer a list of telephone numbers of personnel who will be responsible for the TD. If the TD malfunctions or is damaged, notify the Engineer and place the associated phase on max recall. Respond to TD malfunctions by having a qualified representative at the site within three (3) hours. Restore detection to the condition prior to the malfunction within twenty-four (24) hours.

If the Engineer determines that the nature of a malfunction requires immediate attention and the Contractor does not respond within three (3) hours following the initial contact, then an alternative maintenance service will be called to restore TD. Expenses incurred by the State for alternative service will be deducted from monies due to the Contractor with a minimum deduction of \$500.00 for each service call. The alternate maintenance service may be the traffic signal owner or another qualified Contractor.

TD will terminate when the detection is no longer required. This may be either when the temporary signal is taken out of service or when the permanent detectors are in place and fully operational.

Any material and equipment supplied by the Contractor specifically for TD will remain the Contractor's property. Existing material not designated as scrap or salvage will become the property of the Contractor. Return and deliver to the owner all existing equipment used as TD that is removed and designated as salvage.

Method of Measurement:

Temporary Detection is measured as a percentage of the contract Lump Sum price. Fifty percent (50%) shall be paid when Temporary Detection is initially set up, approved, and becomes fully operational. Fifty percent (50%) shall be paid when Temporary Detection terminates and all temporary equipment is removed to the satisfaction of the Engineer.

Basis of Payment:

This work will be paid at the contract Lump Sum price for "Temporary Detection (Site No.)". The price includes furnishing, installing, relocating, realigning, and maintaining the necessary detection systems and all incidental material, labor, tools, and equipment. This price also includes any detector mode setting changes, timing or program modifications to the controller that are associated with TD. All Contractor supplied material that will remain the Contractor's property will be included in the contract Lump Sum price for "Temporary Detection (Site No.)". Any items installed for TD that will become part of the permanent installation will not be paid for under this item but are paid for under the bid item for that work.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Detection (Site No.)	L. S.

ITEM #1112241A – FIBER OPTIC CABLE SPLICE ENCLOSURE

Description:

This Item shall consist of furnishing and installing splice enclosures to interconnect optical fibers between two or more fiber optic cable segments.

Materials:

A. Applicable Publications

1. Publications listed below form a part of these specifications to the extent referenced. The publications are referred to in the text by basic designation. All Fiber Optic Communication System hardware shall be compliant with the following specifications: Electronics Industries Association (EIA):
 - a. TIA-526-3-89 Fiber Optic Terminal Equipment Receiver Sensitivity and Maximum Receiver Input.
 - b. TIA-455-32A-90/Fiber Optic Circuit Discontinuity.
 - c. EIA-310-C Racks, Panels, and Associated Equipment.
 - d. EIA-359-A Colors for Color Identification and Coding.
 - e. EIA-TIA-455-A Standard Test Procedures for Fiber Optic Fibers, Cable Transducer Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
 - f. EIA-455-6B Cable Retention Test Procedure for Fiber Optic Cable Interconnecting Devices.
 - g. TIA/EIA-598-A Optical Fiber Cable Color Coding.

B. Fiber Optic Splice Enclosure

1. The Splice Enclosures shall accommodate from 60 to 168 fiber splices. Each splice enclosure shall have a splice tray organizer capable of holding 12 to 18 splice trays. The organizer shall provide access to and removal of individual splice trays and permit selective splicing to allow one or more fibers to be cut and spliced to branch cable(s) without disrupting other fibers.
2. The Contractor shall install Splice Enclosures of a capacity that they are capable of handling of 24 fibers more than the current fiber count at any given splice location as shown on the Drawings.
3. The Splice Enclosure shall fit within the space allocated for it as shown on the plans and to operate within the environment in which it is to be installed.

4. The Splice Enclosure shall protect the fiber optic cable splices from mechanical damage, shall provide strain relief for the cable, and shall be resistant to salt corrosion. The enclosure shall be waterproof and airtight, and shall be manufactured of non-corroding materials.
5. The Splice Enclosure shall be designed for a temperature range of -30° C (-22° F) to +70° C (158° F). The splice enclosure shall be capable of performing in a cable vault or pull box, environment where total and continuous submersion in water is to be expected.
6. All materials in the enclosures shall be non-reactive and shall not support galvanic cell action. The outer enclosure shall be compatible with the other enclosure components, splice trays, and cables. The end plate shall consist of two sections and shall have the capacity for a minimum of two cable entries on each end.
7. All Splice Enclosures shall employ re-usable sealing materials allowing multiple re-entrances without replacing any component. Access to the splice enclosures shall be accomplished without the use of special tools or devices. The splice enclosure shall employ a latching mechanism for entrance to the internal components of the enclosure.
8. All environmentally exposed components of the Splice Enclosures shall be UV light resistant.
9. All splice trays shall be lined to provide a contrasting background for splicing colored fibers or as approved by the Engineer. The splice trays shall include clear snap-on covers and tie wraps to secure the buffer or transport tubes to the tray. The splice trays shall be of adequate size to prevent induced attenuation due to fiber bending.
10. Each splice tray shall be capable of accommodating a minimum of 12 fusion splices for the single mode fiber cable of the type selected.
11. The splice tray shall have features that retain the fiber loops and control the bend radius. The splice tray cover shall be clear plastic to allow for inspection of the fibers without opening the tray.
12. Vinyl markers shall be supplied to identify each fiber to be spliced within the enclosure. Each splice shall be individually mounted and mechanically protected on the splice tray.

C. Cable Racking Hardware

1. Cable racking hardware shall be made of a high performance polymer: Each splice enclosure shall be supported in the pullbox by a medium duty rack capable of supporting a minimum load of 445 Newtons. Racks shall not be less than 150mm in length. Medium duty racks shall have 100mm arms minimum. At splice points, the pullbox shall have a horizontal rack capable of supporting, and holding securely in place, a splice closure.

D. Warranty

1. All equipment supplied for this shall be warranted for parts by the vendor against defects and failures, which may occur through normal use for a period of one (1) year from the date of installation. A copy of the warranty must be presented to the Engineer before installation of the equipment.

Construction Methods:

A. Installation

1. Splice Enclosures shall be installed as shown in the Drawings. Unless otherwise specified, outdoor type Splice Enclosures shall be installed within vaults or pull boxes located adjacent to CCTV cameras and at fiber optic cable reel-end splice locations as shown on the Drawings.
2. The installations shall include all required components including sealing kits, cable racking hardware and mounting hardware to achieve an environmentally secure permanent installation.
3. The Contractor shall supply all materials, tools, equipment and labor including but not limited to fan out kits, connectors, trays, splice enclosures, and any other incidentals necessary to complete the installation of the fiber optic cable splice enclosure.
4. The Splice Enclosure shall be secured to the interior of the cavity of the vault or pullbox on cable racking hardware using tie-wraps.
5. The Outdoor Splice Enclosure shall be mounted in such position to allow the cable to enter and exit the enclosure without exceeding the cables minimum bending radius. Sufficient cable shall be coiled in the vault or pull box to allow the Splice Enclosure to be removed from the vault for current and future splicing and cable repairs. The Contractor shall install mounting hardware within the pullbox or splice location to support the splice enclosure and the splice enclosure shall be securely fastened in place. In no cases shall the splice Enclosure be allowed to rest on the bottom of the pullbox or vault.

6. After the splice trays are placed inside the enclosure, the enclosure shall be sealed using a procedure recommended by the manufacturer that will provide a waterproof environment for the splices. Encapsulant shall be used to ensure water resistance. The individual fibers shall be looped one full turn within the Splice Enclosure to avoid micro bending.
7. Care shall be taken at the cable entry points to ensure a tight salt resistant and waterproof seal is made which will not leak upon aging. It is acceptable to have multiple cables enter the fiber optic cable Splice Enclosure through one port as long as all spaces between the cables are adequately sealed.
8. All splices shall be protected with a thermal shrink sleeve and shall be labeled in the splice tray with permanent vinyl markers. Butt ends shall also be labeled to identify the destination of the fiber.
9. The splices shall be fabricated using modern, high quality fusion type splicing equipment. All splicing equipment shall be in good working order, properly calibrated, and meeting all industry standards and safety regulations. Cable preparation, Enclosure installation, and splicing shall be accomplished in accordance with accepted and approved industry standards.
10. Optical fibers shall be spliced as noted on the plans using the fusion type and the maximum splice loss shall not exceed 0.10 dB per splice in each direction. The Contractor shall test all splices for signal loss.
11. Each splice shall be tested for tensile strength by applying a force of not less than 200 grams.
12. All splices shall be arranged neatly in splice trays, supported and protected with a suitable splice protector.
13. Only the fibers required to be spliced to Drop Cables at the CCTV Camera and Mini-Hub locations shall be severed and spliced. Where required, the buffer tube splitting tool recommended by the manufacturer shall be used to open the correct buffer tube. Unsevered fibers in an open buffer tube shall be coiled in the splice tray. When buffer tubes do not need to be opened, at least 4.0 m of unopened buffer tubes shall be coiled in the fiber optic Splice Enclosure.
14. Drop cable entrances to the splice enclosures shall adhere to the manufacturer's recommendations for the type of cable.

15. In order to reduce the overall number of splices required, the cable shall be installed in the maximum continuous reel length provided by the manufacturer, or as shown on the plans, or as approved by the Engineer. Factory splices will not be permitted. Prior to ordering the fiber optic cable, the Contractor shall be required to submit a detailed cable layout plan showing the proposed reel lengths and splice points.
16. Fiber identification shall be in accordance with the tables and schedules provided in the Contract Drawings.
17. Upon completion of the splicing operation, all waste material shall be deposited in suitable containers, removed from the job site, and disposed of in an environmentally acceptable manner.

B. Submittals

1. Submit:
 - a. Functional block diagrams, cable diagrams, and point to point cabling details.
 - b. Product data, installation manuals, materials, system configuration options and features, and accessories.
 - c. Shop Drawings shall be completely dimensioned and shall indicate the intended installation method and details.
 - d. Specifications for all assemblies and subassemblies (eg. High Density Frames, Splice Housings, Connector Panels, Underground Splice Enclosures and associated Splice Trays).
 - e. Installation and maintenance manuals for all equipment.

C. Testing

1. Testing shall be performed to demonstrate that all furnished and installed equipment complies with the requirements of each item, and shall be conducted using Manufacturer recommended procedures, materials and test equipment.

D. Delivery, Storage, and Handling

1. The Contractor shall deliver, store, handle and install all materials and equipment in such a manner as not to degrade quality, serviceability or appearance.
2. The Contractor shall be responsible for storage of the materials and equipment prior to installation in a clean, dry location free from construction dust, precipitation and excess moisture.
3. Contractor shall be required to replace any damaged materials and equipment, as determined by the Engineer, at no additional cost to the owner.

Method of Measurement:

Work under these items shall be measured for payment by the actual number of “Fiber Optic Cable Splice Enclosures” of the type specified, installed, tested, operating and accepted in place.

The Contractor shall note that the required racking in the pullboxes and the vaults is included in the splice Enclosure item.

Basis of Payment:

The work to be done under this item shall be paid at the Contract Price each for “Fiber Optic Cable Splice Enclosure” which price shall include all materials, hardware, termination panels, labor, cables, connectors, tools, equipment and incidentals necessary to complete this work.

The Contractor shall note that the required racking in the pullboxes and the vaults is included in the splice enclosure item.

ITEM #1112252A – EQUIPMENT OPERATIONS (ESTIMATED COST)**Description**

The purpose of this item is to provide the necessary services required to maintain the Incident Management System (IMS) equipment installed, operating to the manufacturer's specifications, so as to provide a means to monitor, detect and manage incidents as they occur on the highway. The work included in this item will commence upon completion of the 30 day Operational Test or as directed by the Bureau of Highway Operations discussed elsewhere in the contract documents. In general, the Contractor will be responsible for maintaining all field items between the CCTV sites and the Highway Operations Center (HOC). The Contractor shall meet with the telephone company if necessary in the event a failure or error occurs with the telephone equipment or the equipment installed by this project. A listing of the majority of the items that are the responsibility of the Contractor, referred to as the "Installation Contractor", is shown at the end of this specification.

Materials

All materials utilized to maintain and repair the Incident Management System shall be in conformance with the specifications of this project or shall be in conformance with the specifications of the Procurement Contract, or as recommended by the manufacturer.

The Contractor shall provide all the cables, connectors, tools, replacement equipment and labor necessary to successfully maintain the equipment.

The Contractor shall be able to use replacement parts available from the State of Connecticut inventory in order to expedite the repair process. As soon as possible and to the State's satisfaction, the Contractor shall provide replacement equipment to be re-entered into the State's inventory.

The Contractor shall provide documentation certifying the manufacturer's repair or replacement of the spare equipment upon return of the equipment to the Department.

Construction Methods

The Contractor shall maintain the existing Camera 84E-3 during the duration of the project.

Certification:

The Contractor shall provide the State with evidence satisfactory to the State that they fully understand the purpose for which the equipment is intended and they are qualified and capable of fulfilling all provisions of this item. The Contractor as well as individual personnel performing this work shall be certified by all manufacturers of the equipment to be maintained as being

capable of maintaining the equipment and also capable of obtaining and installing the necessary spare parts to keep the system on-line. The Contractor, prior to the commencement of the start of the equipment operations, shall be required to submit training certificates for all of the pertinent equipment.

Response Time:

The Contractor shall service and maintain the IMS installation at the conclusion of the 30 Day Operational Test for each section, as allowed by the Engineer. All IMS equipment shall be serviced and maintained on a twenty-four (24) hour a day, seven days a week basis. The Contractor shall provide a suitable means of communication between them and the Highway Operations Center (HOC). This shall include a twenty-four (24) hour telephone number for emergency purposes and a fax number for emergency purposes and a fax number for daily communications and log activities. Repairs shall commence not more than 8 hours after notification and shall be completed within 24 hours of notification.

The Contractor shall be responsible for coordination of work. The Contractor shall coordinate the service described herein with any equipment or work to determine the cause of the errors or failures to successfully restore the video and data communications. The Contractor shall meet with the telephone company if necessary in the event a failure or error occurs with the telephone equipment or the equipment installed by this project. The Contractor shall coordinate between the Contractor, Engineer, Telephone Company and HOC representative to discuss the requirements and time table of this service.

The Contractor shall keep a neat and accurate log book of all the malfunctions reported with the date and time that the information was received and the nature of the problem. The log book shall be submitted to the Engineer monthly or upon request by the Engineer. The Contractor shall include in the log book the time that each unit is checked for proper operation, the condition of each unit checked, and the date and time each unit was restored to proper operation or replaced.

Work performed under this item shall conform to the latest National Electrical Code standards, local electrical codes, and Department of Transportation installation requirements. The Contractor shall conform to these requirements as specified herein.

Method of Measurement

This item shall be measured for payment as provided under Article 1.09.04 – Extra and Cost Plus Work.

The sum of money shown on the estimate and in the itemized proposal as “Estimated Costs” for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will

be disregarded and the original price will be used to determine the total amount bid for the contract.

Basis of Payment

This work will be paid on a cost-plus basis according to Article 1.09.04 – Extra and Cost Plus Work. Warranties in effect for equipment associated with camera operation shall be honored by the suppliers of the equipment. Contractor or sub-contractor will be responsible for securing warranted equipment and installation. There will be no payment for materials included under a manufacturers warrantee. Labor costs only will be reimbursed on a cost plus basis.

If warranties have expired, any equipment and labor that must be repaired will be paid on a cost plus basis.

ITEM #1111600A – EXTENSION BRACKET

ITEM #1112210A – CAMERA ASSEMBLY

ITEM #1112259A – VIDEO DETECTION PROCESSOR

ITEM #1113901A – CAMERA CABLE

Description:

Furnish and install a Video Image Detection System (VIDS) as shown on the plans or as directed by the Engineer. The VIDS consists of a Camera Assembly (CA), Video Detection Processor (VDP), Video Detection Monitor (VDM) and Camera Cable. The Training and Extension Bracket will be included on a case-by-case basis.

Materials:

All hardware shall be new, corrosion resistant. All equipment shall be current production.

Camera Assembly:

Camera:

- Monochrome (Black and White) or Full Color camera.
- Fixed mount pan and tilt unit bracket.
- Image Sensor: 0.3-inch (7.62mm) to 0.5-inch (12.7mm), charge-coupled device (CCD).
- Sensitivity: Full peak-to-peak video with 2 lux 2854 K incandescent illumination on the image sensor faceplate.
- Active picture elements (pixels): 720(H) x 480 (V), minimum.
- Resolution: Minimum 470 lines horizontal and 330 lines vertical, NTSC equivalent.
- Automatic white balance: Automatic white balance sensor through the lens for color balancing.
- Video Signal format: EIA-170 composite video output at 1 Volt peak-to-peak.
- Output impedance: 75 Ohms nominal.
- Signal to noise ratio: Greater than 50dB.
- Lens mount – standard 16 mm C-mount and compatible with the camera.

Camera Enclosure:

- Tamper proof constructed of painted or powder coated aluminum of at least 0.06-inch (1.59-mm) thickness.
- Environmentally sealed housing.
- Adequate adjustable sunshield should be provided.

- Internal Heater, window defroster, and an adjustable thermostat to control both. Turn-on point from 0° to 5° C (32° to 41° F). Metal oxide varistor (MOV), or equivalent, surge suppression connected to ground, on the switched outputs of all thermostats. Prior approval by the VDP manufacturer and the Engineer is necessary for any deviations to the above specifications.

Extension Bracket:

- Single arm [10' (3.0m) or less], or Truss type [10' (3.0m) or greater].
- Length shown on plan.
- Clamp-on attachment to pole shaft.
- Designed to support minimum 30 lbs. (13.6 Kg), 2 sq.ft. (.2 sq.M) end load with minimal movement from wind.
- Schedule 40, 2" IPS galvanized pipe.
- Heavy duty galvanized finish
- Refer to detail drawing contained herein.

Video Detection Processor:

Functional:

- Receive inputs from a minimum of two cameras.
- Sense vehicle activity from minimum eight detection zones per camera.
- Sense departing vehicle activity as well as approaching vehicle activity.
- Emulate minimum four (4) "contact closure" loop amplifier outputs in pulse, presence, delay, delay inhibit, and extend mode as specified in NEMA TS 1, Section 15.
- Include image stabilization that corrects for video movement caused by average wind speed of 20 mph (32 kph).
- Include automatic shadow cancellation of stationary shadows and moving shadows.
- Fail-safe in the event of loss of video from CA or loss of power to VDP.
- Accept standard analog NTSC color or monochrome video signal (1 volt peak to peak, 75 ohm) from the CA or a video recording device.
- Provide output of standard analog NTSC color or monochrome video signal through a video out female RCA/BNC style connector (1 volt peak to peak, 75 ohm) which may be switched to any video input.

Accuracy (Compared to actual vehicle observation of video over ½ hour time period).

- Occupancy: 20% true occupancy.
Example: If observed occupancy is 20%, reported occupancy must be between 16% and 24%.
- Volume: 95% true counts under normal weather conditions.
90% true counts under adverse weather conditions (rain, snow, fog).

- Demand (presence) at stop bar: 98 % under all weather conditions.
- Speed: 20% true speed as measured by radar gun.
- Maintain above accuracy throughout nighttime and day-night-day (dusk-dawn) transition.

Detection Zone Programming:

- Serial communication with the PC through front panel mounted EIA-232 port.
- Menu driven procedure on the PC, using Windows 95, 98, NT 4.0, or 2000 system.
- Configure and adjust the detection zone with the cabinet mounted Video Detection Monitor (VDM), using a standard detachable keyboard/mouse. Capable of displaying a NTSC or PAL formatted signal.
- Minimum data rate of 9600 bits/second.
- Detection zone data stored in non-volatile memory so that after recovery from power interruption, all parameters are returned to latest settings.
- Ability to upload and down load program database to notebook PC or remote desktop PC.
- Superimpose detection zone on real time video image from selected camera with time stamping capabilities.
- Ability to monitor real time video and adjust zones while VDP is actuating the traffic controller.
- Visual confirmation of detection by highlighting detection zone symbols.

Physical:

- Either shelf mounted, stand alone design or modular card rack design.
- Aluminum card rack frame capable of accepting four (4) VDP modules.
- Double row 22 pin (44 terminal) edge connector, Cinch Jones 50-44A-30M or equivalent, which mates with NEMA TS 1 detector rack system.
- Standard BNC connectors for video input and video output.
- Female metal shell connector with latching clamp for NEMA TS 1 detector outputs.
- LED indications to monitor all detector outputs.
- Side or rear mounted connectors and controls are not allowed on stand alone units.
- NEMA FR-4 glassepoxy or equivalent circuit boards.

Environmental:

- Comply with NEMA TS 2, Section 2 requirements for Controller Assembly.
- Pass following NEMA TS 2 tests and applicable test procedures.
 - Vibration: Section 3.13.3, Section 3.13.8.
 - Shock: Section 3.13.4, Section 3.13.9.

- Transients, Temperature, Voltage and Humidity: Section 3.13.7.
- Power Interruption: Section 3.13.10.

Video Detection Monitor:

Physical:

- Compact and easily accessible LCD Flat Panel Display.
- Diagonal screen size minimum 9" & maximum 14".
- Weigh <10 pounds (4.5kg).
- Withstand temperatures ranging from -30 to 74 degrees Celsius (-22 - 165 °F), 90% non-condensing.
- Withstand mechanical shock of 10 G's peak acceleration (11 ms, half sine wave).
- Accept vibrations of 5 to 500 Hz at 1 G RMS random vibration.

Functional:

- Compatible with Color or Monochrome Detection systems.
- Compatible with male RCA inputs or male BNC connector from a minimum of one VDP.
- Industrial grade (grade A) video panel employing thin film transistor (TFT) technology.
- ANSI contrast ratio of 300:1 minimum.
- Minimum brightness level: 300 candelas per square meter (300 lux).
- Computer resolutions: 720 (horizontal) x 480 (vertical) minimum, 1024 (horizontal) x 768 (vertical) maximum.
- Support 16.2 million display colors.
- Support both NTSC and PAL video formats with auto-sensing.
- Pixel rise time: ≤ 2 milliseconds. Pixel fall time: ≤ 6 milliseconds.
- Minimum pixel pitch: 0.064 (horizontal) x 0.2025 (vertical) millimeters.
- Minimum viewing angle: 140 degrees horizontally, 120 degrees vertically.
- On-Screen Display (OSD) controls brightness, contrast, phase, clock, color as well as horizontal and vertical positioning.
- Compatible with processor output (VGA analog RGB, S-Video and composite video interfaces)
- Operable on 110 VAC or 220 VAC, 50 or 60 Hz.
- Battery operation capabilities but not to require use of any batteries(s).
- FCC, VCCI, EMC, and CE approved. UL listed. Energy Star efficient.
- MTBF Rating: 50,000 hours minimum.

Peripherals:

- Separable Keypad & Joystick or Computer Mouse including all necessary cables for connectivity to VDP.

Camera Cable:

- Supply the CA power and return the video signal to the VDP.
- Siamese construction RG-59/U, or as recommended by camera manufacturer.
- Coaxial:
 - 20 AWG, solid conductor.
 - Polyethylene foam dielectric.
 - Bare copper braid shield.
- Twisted pair:
 - 18 AWG, 7 strand conductor.
 - Aluminum foil shield.
 - Color code red and black.
- Polyethylene or polyvinyl chloride jacket.
- Other type cable may be substituted at the request of the VDP manufacturer.

Documentation: (VDP, VDM and CA)

Provide to the **Department of Transportation Office of Maintenance** three (3) copies of equipment manuals furnished by the manufacturer, which includes the following:

- Installation and operation procedures.
- Performance specifications (functions, electrical, mechanical and environmental) of the unit.
- Schematic diagrams.
- Pictorial of component layout on circuit board.
- List of replaceable parts including names of vendors for parts not identified by universal part numbers such as JEDEC/RETMA or EIA.
- Troubleshooting, diagnostic and maintenance procedures.

Site Survey:

Perform a site survey with the VDP manufacturer representative at all VIDS locations. The purpose of the survey is to optimize the performance from the VIDS equipment when it is installed and insure that it will meet the accuracy requirements specified previously. Submit the results of this survey to the Engineer in a report, which lists all VIDS locations with any recommended changes to camera locations, mounting adjustments, camera lens adjustments, and desired detection zone locations.

Warranties and Guarantees: (VDP and CA)

Provide warranties and guarantees to the **Department of Transportation Office of Maintenance** in accordance with Article 1.06.08 of the Standard Specifications. Warranties for all equipment furnished as part of this Contract are to cover a period of 24 months following successful completion of the entire intersection acceptance test.

Training:

Provide a minimum of six (6) hours of training for up to eight (8) representatives from the offices of District Maintenance and Traffic Engineering. Include three (3) hours classroom and three (3) hours hands-on instruction of the VIDS.

- Theory of operation; Program and operation instructions; Circuit description.
- Troubleshooting; Preventative maintenance; field diagnostics; and field adjustments.

Training sessions will be scheduled at a mutually agreed time and location after installation of VIDS.

Construction Methods:

Install VIDS equipment in accordance with the manufacturer instructions and recommendations to achieve the detection zones as shown in the plans and accuracy as described in these specifications. The location of the CA shown on the plan may be revised as a result of the Site Survey. VDM and peripherals are to be furnished and fully installed in an easily accessible position within the controller cabinet. Leave proper clearance(s) surrounding video monitor to allow for accessible connections and space to utilize surrounding equipment.

Method of Measurement:

Training will be measured for payment at the lump sum price at the completion of the training session.

The Camera Assembly will be measured for payment as the number of cameras furnished, installed operational and accepted.

The Extension Bracket will be measured for payment as the number of brackets furnished, installed and accepted.

The Video Detection Processor will be measured for payment as the number of units including all additional work and materials listed in Basis of Payment, furnished, installed, operational and accepted.

Camera Cable will be measured for payment as linear feet (meters), furnished, installed and accepted.

Basis of Payment:

The lump sum bid price for Training includes the necessary instruction manual, maintenance manual, schematics etc. of all VIDS equipment, for all attendees of the training session.

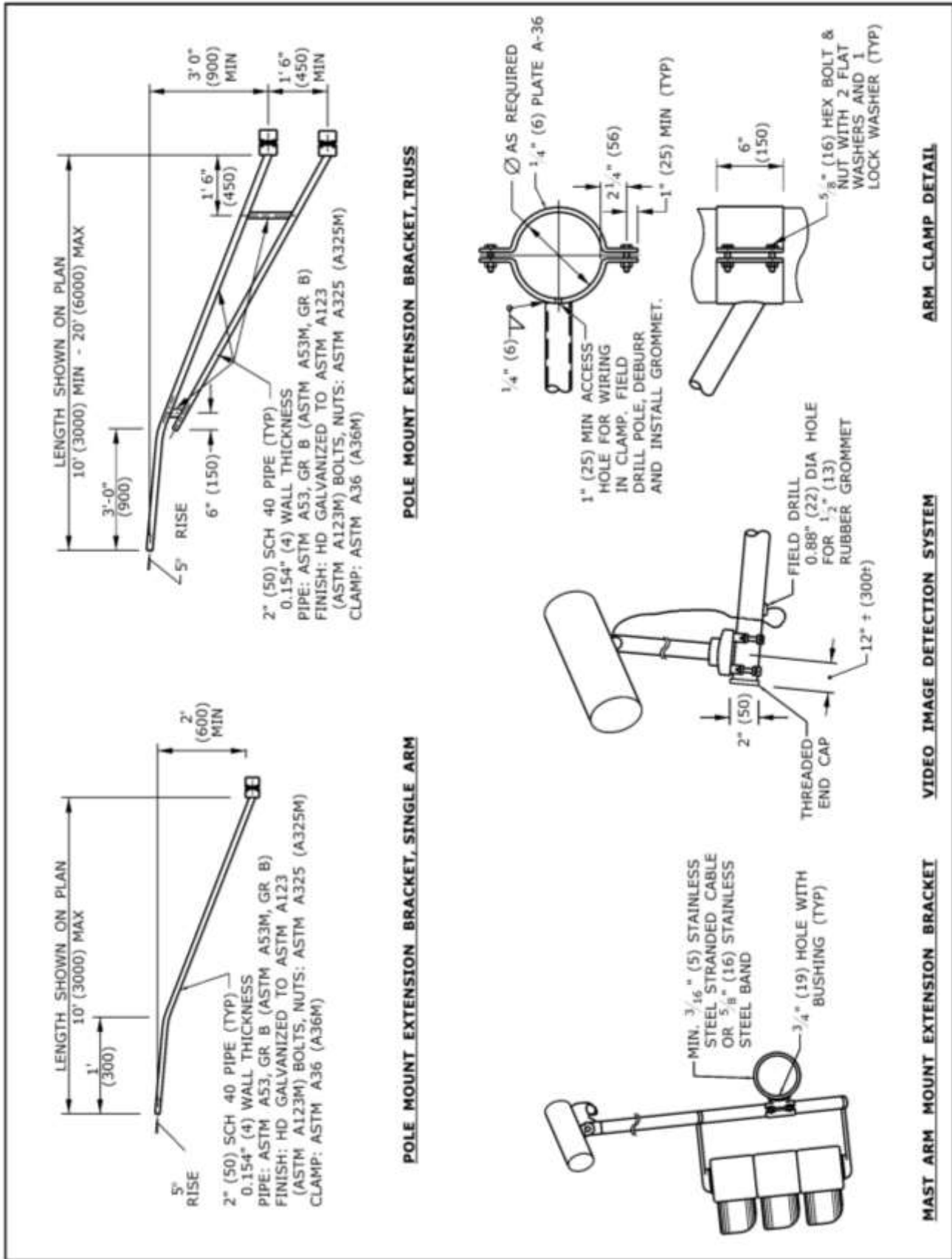
The unit bid price for Camera Assembly includes the camera, enclosure, brackets used to attach the CA to a support structure or extension bracket, documentation, warrantee, labor, tools and equipment necessary to provide the specified video signal to the VDP.

The unit bid price for Extension Bracket includes all labor, tools and equipment necessary to attach the bracket to a pole shaft.

The unit bid price for Video Detection Processor includes the manufacturers' site survey, unlimited number of any necessary VIDS configuration software and license, card rack frame, power supply, all miscellaneous hardware such as PC interface cable with connectors, Cabinet Mounted Video Detection Monitor with necessary peripherals, documentation, warrantee, labor, tools and equipment necessary to make the VIDS fully operational.

The unit bid price for Camera Cable includes all connectors, labor, tools and equipment necessary to install the cable between the CA and the VDP.

<u>Pay Item</u>	<u>Pay Unit</u>
Camera Assembly	Ea.
Extension Bracket	Ea.
Video Detection Processor	Ea.
Camera Cable	LF (M)



**ITEM #1113604A – OPTICAL FIBERCABLE – SINGLE MODE, LOOSE
BUFFER TUBE CABLE, 6 FIBER**

Description:

This Item specifies the requirements for furnishing, installing in conduit, splicing, and connectorizing fiber optic cables. As part of this item, the Contractor shall install a pull tape in all of the innerducts within the contract limits of work, as necessary to install the fiber optic cable and future fiber optic cable.

Materials:

A. General

1. The fiber optic cable supplied in this project shall be completely compatible with the existing cable supplied under Project 63-548/42-288. The cable shall be compatible with Fitel/Lucent single jacket loose tube fiber optic cable with DryBlock Core. The Contractor shall provide proof of compatibility to the Department with the appropriate shop drawings and catalog cut submittals.
2. Outdoor fiber optic cable shall be installed in conduit, spliced as required and terminated in Camera-Hub Cabinets and Mini-Hub Cabinets, as shown on the Drawings.
3. Plenum-rated indoor fiber optic cable shall be installed inside the State Transportation Building within existing conduits, spliced as required and terminated at the fiber optic patch panel, as shown on the Drawings.
4. The fiber optic cable, splices, connectors and interconnect panels shall meet all requirements stated in this Specification.
5. All optical fiber cables used in this project shall be from the same manufacturer. That manufacturer shall be regularly engaged in the production of fiber optic cables. Each optical fiber cable for this project shall be dielectric, loose tube, duct-type.

B. Applicable Publications

1. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation. All Fiber Optic Communication System hardware shall be compliant with the following specifications:

Electronics Industries Association (EIA):

- a. EIA-310-C Racks, Panels, and Associated Equipment.
 - b. EIA-359-A Colors for Color Identification and Coding.
 - c. EIA-422-A Electrical Characteristics of Balanced Voltage Digital Interface Circuits.
 - d. EIA-TIA-455-A Standard Test Procedures for Fiber Optic Fibers, Cable Transducer Sensors, Connecting and Terminating Devices and Other Fiber Optic Components.
 - e. EIA-455-6B Cable Retention Test Procedure for Fiber Optic Cable Interconnecting Devices.
 - f. EIA-485 Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems.
 - g. TIA/EIA-598-A Optical Fiber Cable Color Coding.
2. USDA Rural Utilities Service (RUS) 7 CFR 1755.900.
 3. ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1992.
 4. UL-listed OFNR
 5. CSA-listed FT-4

C. Outdoor Fiber Optic Cable Requirements

1. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 and meet the requirements of the ANSI-ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1992.
2. The Outdoor Fiber Optic Cable shall be stranded loose tube cable with the required number of fibers as shown in the Contract Drawings. The buffer tubes shall contain 12 fibers per tube unless otherwise noted in the Contract.
3. The Contractor shall provide manufacturer's documentation certifying that the Outdoor Fiber Optic Cable complies with the following performance requirements:

- a. When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures -40°F and +158°F (-40°C and +70°C) shall not exceed 0.2 dB/km at 1550 nm for single-mode fiber.
- b. When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable," a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for cable end.
- c. When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable", the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 149°F (65°C).
- d. When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 220 N/cm (125 lbf/in) applied uniformly over the length of the sample. The load shall be applied at the rate of 1/10 in to 3/4 in (3 mm to 20 mm) per minute and maintained for ten minutes. The change in attenuation shall not exceed 0.4 dB during loading and 0.2 dB after loading at 1550 nm for single-mode fiber.
- e. When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber.
- f. When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," the cable shall withstand 25 impact cycles. The change in attenuation shall not exceed 0.2 dB at 1550 nm for single-mode fiber.
- g. When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 22 in (560 mm), the cable shall withstand a tensile load of 608 lbf (2700 N). The change in attenuation shall not exceed 0.2 dB during loading and 0.1 dB after loading at 1550 nm for single-mode fiber.

- h. When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 13 feet (4 meters) shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.1 dB at 1550 nm for single-mode fiber.
 - i. When tested in accordance with FOTP-181, "Lightning Damage Susceptibility Test for Optic Cables with Metallic Components," the cable shall withstand a simulated lightning strike with a peak value of the current pulse equal to 105 kA without loss of fiber continuity. A damped oscillatory test current shall be used with a maximum time-to-peak value of 15 μ s (which corresponds to a minimum frequency of 16.7 kHz) and a maximum frequency of 1800000 rpm (30 kHz). The time to half-value of the waveform envelope shall be from 40 - 70 μ s.
 - j. When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable", the cable shall withstand four full turns around a mandrel of ≤ 10 times the cable diameter for non-armored cables and ≤ 20 times the cable diameter for armored cables after conditioning for four hours at test temperatures of -22°F and +140°F (-30°C and +60°C). Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears or other openings. Optical continuity shall be maintained throughout the test.
4. All optical fibers, coatings, tubes, metals and jackets shall be free of roughness, porosity, blisters, splits and voids in accordance with good manufacturing practice.
 5. The color coding and position of fibers / buffer tubes within the cable shall be in accordance with TIA/EIA-598-A "Optical Fiber Cable Color Coding". Fibers shall be colored with ultraviolet curable ink. In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and not subject to fading or smearing onto adjacent fibers or into the gel filling material. Color materials shall not cause fibers to stick together.
 6. The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.
 7. The cable shall be suitable for operation over a temperature range of -22°F to +158°F (-30°C to +70°C) and shall be suitable for installation in outdoor ducts.
 8. The cable shall provide mechanical support and protection for the specified number of fibers.
 9. The central anti-buckling member shall consist of a dielectric, glass reinforced plastic (GRP) rod. The GRP rod shall be coated with a black colored thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.

10. All interstices within the cable outer jacket and within each buffer tube shall be filled with a compound to prevent the ingress and migration of water. The compound shall be a non-hygroscopic, non-nutritive to fungus, electrically non-conductive, homogeneous gel that is nontoxic and dermatologically safe. The gel shall be free from dirt and foreign matter. Some leakage of the compound is permitted, however, there shall be no bulk flow of compound out of the cable over the specified operating temperature range which could impact on the waterproofness of the cable. The gel shall be readily removable with conventional nontoxic solvents.
11. Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process. Water blocking yarn(s) shall be applied longitudinally along the central member during stranding.
12. A water blocking tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The tape shall be held in place by a single polyester binder yarn. The water blocking tape shall be non-nutritive to fungus and electrically non-conductive.
13. The cable shall be able to withstand a maximum pulling tension of 607lbf (2700 N) during installation without any resulting damage. Tensile strength shall be provided by dielectric yarns. The high tensile strength dielectric yarns shall be helically stranded evenly around the cable core.
14. The outer jacket of the cable shall be constructed of medium or high density polyethylene. The minimum nominal jacket thickness shall be 1/20 inch (1.4 mm). Jacketing material shall be applied directly over the tensile strength members and water blocking tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus. MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C and Grades J4, E7 and E8.
15. The cable shall contain at least one ripcord under the sheath (outer cable jacket) for easy sheath removal of all-dielectric cable.
16. The cable jacket shall be marked with manufacturer's name, sequential meter or foot markings, month, year or quarter year of manufacture, and a telecommunications handset symbol, as required by Section 350G of the National Electrical Safety Code. The actual length of the cable shall be within 1% of the length markings.
17. Materials used in the cable shall not produce hydrogen in a concentration large enough to cause any degradation in the transmission performance of the optical fibers.
18. Materials used in the cable shall not support galvanic action.

D. Single Mode Optical Fibers

1. The Single Mode fiber shall consist of a doped silica core surrounded by a concentric silica cladding. The fiber shall be matched clad design.
2. The dispersion un-shifted or dispersion flattened single mode fiber shall conform to the following specifications:
 - a. The Single Mode fiber core shall have a diameter of between 8.3 to 9 μm inclusive with a tolerance of $\pm 1.3 \mu\text{m}$.
 - b. The Single Mode fiber cladding shall have an outer diameter of 125 μm with a tolerance of $\pm 1.0 \mu\text{m}$.
 - c. The core-to-cladding offset shall not be greater than 0.6 μm .
 - d. The cladding Non-Circularity shall not be greater than 1.0% defined as:
 $(1 - \text{Minimum Cladding Diameter} / \text{Maximum Cladding Diameter}) \times 100$
 - e. The Single Mode fiber shall be coated with a protective polymer to preserve the strength of the fiber. The coating shall be removable by mechanical or chemical means. The coating shall retain its color when subject to the manufacturer's recommended fiber cleaning and splicing preparation methods.
 - f. The SM fiber shall have attenuation and bandwidth specified at two wavelength windows.
 - i. The first wavelength window shall be at and around 1310 nm.
 - ii. The second wavelength window shall be at and around 1550 nm.
3. The mean optical attenuation at 1310 nm shall not be greater than 0.4 dB/km with a standard deviation not greater than 0.05 dB/km. The maximum attenuation of any continuous length of SM fiber at 1310 nm shall not exceed 0.45 dB/km.
4. The mean optical attenuation at 1550 nm shall not be greater than 0.3 dB/km with a standard deviation not greater than 0.06 dB/km. The maximum attenuation of any continuous length of SM fiber shall not exceed 0.36 dB/km.
5. The fiber attenuation shall not vary more than 0.2 dB/km over the specified cable operational temperature range.

6. The fiber optical bandwidth at 1310 nm or 1550 nm shall be equal to or greater than 1000 MHz-Km.
7. The zero dispersion wavelength shall be at a wavelength of 1310 ± 10 nm.
8. The maximum dispersion at 1550 nm shall not exceed 18 ps / (nm-km).
9. The maximum dispersion in the wavelength range of 1285 to 1330 nm shall not exceed 3.2 ps / (nm-km).

E. Fiber Optic Distribution Cable

1. This item consists of furnishing and installing optical fiber cables and connectors of the size and type specified at the locations shown on the Drawings or as indicated by the Engineer, in accordance with these Specifications.
2. The Contractor shall provide multiple fiber, stranded, loose tube cable with single mode fiber that shall be suitable for placement in an underground environment as shown in the Drawings.
3. The optical fiber capacity of the fiber optic distribution cables to be supplied and installed under this Contract will vary in capacity according to network topology and traffic requirements. The current minimum requirements are for distribution cable to be of the following capacities: 72 SM **Refer to Drawing**, Fiber Optic Cable Plant. (Note SM refers to the number of Single Mode fibers within a cable segment.)
4. The Contractor shall provide a manufacturer's certification that the offered cable complies with all optical and mechanical requirements set forth in this Specification. Any deviation of the offered cable from the specifications set forth herein shall be clearly noted in the Contractor's proposal.
5. All optical fiber distribution cable used on this project shall be from the same manufacturer. Each optical fiber cable shall be all dielectric, duct type, loose tube and shall conform to these Specifications.

F. Fiber Optic Drop Cables

1. Drop cables are used for connecting Camera cabinets, Camera Mini-Hub cabinets and the VMS cabinets to the fiber optic distribution (trunk) cable.
2. The Drop Cable shall consist of single mode fibers housed in a protective jacket. The end of the fiber installed at the Camera, Mini-Hub or VMS cabinet shall be connectorized. The other end of the drop cable shall be spliced into a fiber optic distribution cable at an underground Splice Closure within an adjacent pull box.

3. The exact number of Drop Cables at each Splice Closure shall be in accordance with the Contract. The Contractor shall employ the most efficient means of meeting the Drop Cable requirements, as approved by the Engineer.
4. The attenuation of Drop Cable after installation, not including the connector loss, shall not exceed 0.1 dB measured at 1310 nm and 1550 nm.

G. Fiber Optic Connectors

1. The ST connector shall have a ceramic ferrule with a nickel plated nut and body. SC connectors shall have a ceramic insert.
2. The connector shall be of the ST-type or SC-type and fully compatible with the fiber optic cable utilized and the mating jacks to which they will be attached.
3. The connector shall be compatible with a physical contact (PC) finish. All connectors shall be polished to a PC finish such that the return loss per mated pair of connectors is at least 25 dB. The return loss when the connector is mated with previously installed connectors shall be at least 18 dB.
4. The connector mean loss shall not be greater than 0.2 dB with a standard deviation of not greater than 0.1 dB.
5. Index matching fluids or gels shall not be used.
6. The connector loss shall not vary more than 0.1 dB after 500 repeated matings.
7. The connector shall withstand an axial load of 30 lb (135 N).
8. The connectors shall be attached in accordance with the manufacturer's recommended materials, equipment and practices.
9. The connector shall be suitable for the intended environment and shall meet the following environmental conditions.
 - a. Operating Temperature: -4°F to +122°F (-20 to +50o C)
 - b. Storage Temperature: -22°F to +140°F (-30 to +60o C)
 - c. The connector loss shall not vary more than 0.2 dB over the operating temperature range.

- d. Connectors shall be protected by a suitably installed waterproof protection cap.

H. Pull Tape

1. Pull tape, to be installed in specific areas of the project as described elsewhere in this specification, shall consist of polyethylene or PVC jacket woven into the polyester tape. The recommended pull tape is NEPTCO Part No. DP1250P, or approved equal. The pull tape shall not “burn in” to the innerducts under normal pulling conditions or as specified herein.

The pull tape shall have the following properties:

- a. 1250 lb (5560 N) tensile strength
- b. flat, not round construction
- c. printed foot markings
- d. Pre-lubricated
- e. Moisture resistant

I. Fiber Optic Cable Fabrication

1. Packing and Shipment

- a. The cable shall be supplied on reels. Top and bottom end of the cable shall be available for testing. Both ends of the cable shall be sealed to prevent ingress of moisture.
- b. The optical cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable. Installation procedures and technical support shall be furnished upon request.
- c. Each reel shall have the following information clearly labeled on it:
 - i. Customer
 - ii. Customer order number
 - iii. Reel number
 - iv. Destination
 - v. Ship date
 - vi. Manufactured date
 - vii. Manufacturer's name
 - viii. Cable code

ix. Length of cable

J. Warranty

1. All equipment supplied for this shall be warranted for parts and labor by the vendor against defects and failures, which may occur through normal use for a period of one (1) year from the date of installation. A copy of the warranty must be presented to the Engineer before installation of the equipment.

K. Quality Assurance

1. The Contractor shall have a Quality Assurance Program in place.
2. A minimum of ten (10) year's experience in the design, manufacture, and testing of Fiber Optic Cable and Connectors is required. The cable and connectors shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

Construction Methods:

A. Submittals

1. Submit:
 - a. Functional block diagrams, cabling diagrams, and point to point cabling details, including locations of all distribution cable splice points (both drop cable splices and reel-end splices).
 - b. As built drawings including a cable route diagram indicating the actual cable route and "meter marks" for all interchanges, intersections, directional change points in the cable routing, and all termination points. The Contractor shall record these points during cable installation. Cable system "as-built" drawings showing the exact cable route shall be provided by the Contractor to ConnDOT. Information such as the location of slack cable and its quantity shall also be recorded in the cable route diagram.
 - c. Product data, manufacturer's test certifications, installation manuals, materials, system configuration options and features, and accessories.
 - d. Shop Drawings shall be completely dimensioned and shall indicate the intended installation method and details.
 - e. Specifications of cable, connectors, and fiber splice kits.
 - f. Operating and maintenance manuals for all equipment.
 - g. Vendor Optical Time Domain Reflectometer (OTDR) certification for each reel of fiber optic cable listing each specification compliant fiber by fiber color code and group color code.

B. Delivery, Storage, and Handling

1. The Contractor shall deliver, store, handle and install all materials and equipment in such a manner as not to degrade quality, serviceability or appearance.
2. The Contractor shall be responsible for storage of the materials and equipment prior to installation in a clean, dry location free from construction dust, precipitation and excess moisture.
3. Contractor shall be required to replace any damaged materials and equipment, as determined by the Engineer, at no additional cost to the owner.
4. Cable shall be transported to site using cable reel trailers.
5. Care shall be taken at all times to avoid scraping, denting, or otherwise damaging the cable before, during or after installation. Damaged cable shall be replaced by the Contractor without additional compensation.
6. Sufficient slack shall be pulled to allow cable cutting and connection to communications equipment.

C. Installation in Ducts

1. Cable shall be installed in innerduct, duct or conduit in the field in accordance with the Contract Drawings.
2. Fiber Optic Distribution Cable shall be installed in the lowest innerduct (relative to ground level). Where more than one cable is to be installed in a conduit, the mid-level innerduct shall be used, and the highest level innerduct shall be reserved.
3. The Contractor shall install pull tape in the existing innerducts as necessary to install the fiber optic cable. A 6.5 ft (2.0 m) length of pull tape shall be left coiled, tied, and accessible in each cabinet, vault, maintenance hole and junction box. The pull tape shall be installed according to manufacturer recommendations and shall be “free” and NOT helical about communications cables.
4. The Contractor shall install cables in innerducts consistently throughout the project; crossover of a cable from one innerduct to another is not allowed.
5. Duct ends shall have all rough ends smoothed to prevent scraping the cable.
6. Where cable will be installed directly in conduit with no innerduct, a stiff bristle brush shall be pulled through each section of duct before pulling cable.

7. The Contractor shall not exceed the manufacturer's recommended safe pulling tension and minimum bending radius during delivery and installation.
8. A manufacturer's recommended lubricant shall be applied to the cable to reduce friction between the cable and the duct.
9. A cable grip shall be attached to the cables so that no direct force is applied to the optical fiber. The cable grip shall have a ball bearing swivel to prevent the cable from twisting during pulling.
10. Cable rollers and feeders and winch cable blocks shall be used to guide the cable freely into the duct and at maintenance hole locations.
11. Mechanical aids and pulling cable or ropes shall be used as required.
12. The Contractor shall employ personnel at as many pull points as need be to achieve the longest continuous cable segment as possible to reduce the need for excessive main-line splices.
13. Personnel equipped with two-way radios shall be stationed at each maintenance hole, cabinet and communications vault at which the cable is to be pulled to observe and lubricate the cable.
14. Where mechanical pulling is required (i.e. all runs greater than 164 ft (50 m)), a dynamometer shall be used to record installation tension and a tension limiting device shall be used to prevent exceeding the maximum pulling tension as defined by the cable manufacturer. The maximum pulling tension shall be recorded for each run of cable. The cable shall be taken up at intermediate pulling points with an intermediate cable take-up device as approved by the Engineer to prevent over tension on the cable. Cable pulls shall be continuous and steady between pull points and shall not be interrupted until the entire run of cable has been pulled.
15. Trunk fiber cable segment lengths shall be the maximum tolerable length within the maximum pulling tension defined by the manufacturer. The number of trunk cable reel-end splices shall be minimized. The Contractor shall provide a plan to the Engineer showing the reel-end splice point locations following a field investigation of the conduit and shall not install cable until receiving the Engineer's approval of the reel-end splice location plan. The Contractor shall obtain the Engineer's approval for all required changes to the reel-end splice point location plans. Cable segments installed with reel-end splices not approved by the Engineer will be replaced by the Contractor at no additional cost to the Department.
16. The Contractor shall be responsible for ensuring the cable length is sufficient to allow for connection between the communication equipment and the splice enclosures

- including provision for slack, vertical runs, cable necessary for splicing, wastage and cable to allow for the removal of the splice enclosure for future splicing.
17. Drop Cables shall be of length suitably long to be connected to the rack mounted fiber optic transmission equipment within the Camera Hub and the rack-mounted Splice Closure in the Mini-Hub. Sufficient slack shall be left at each end to allow removal of the Splice Closure and tray, and relocation of the equipment anywhere within the cabinet.
 18. Drop Cable fibers in the Camera Hub Cabinets shall be connectorized and the Active Fiber connected directly to the Optical Video/Data Transceiver. The Spare Fiber with Connector shall be safely and securely attached to the interior of the equipment rack with plastic ties. The cable shall not be stressed beyond the minimum bending radius at any time.
 19. Drop Cable fibers in the Mini-Hub Cabinet shall be spliced to pig-tails in a rack-mounted splice closure provided by others. Splicing shall be in accordance with the requirements specified elsewhere in these Specifications and as shown on the Drawings. All unused fibers shall be properly terminated in accordance with manufacturer recommendations.
 20. All cable ends, connectors, and fiber optic jacks shall be protected from moisture ingress by using properly sealed caps.
 21. Following installation of the cable in the ducts, all duct entrances at pedestals and cabinets shall be sealed with duct sealing compound to prevent the ingress of moisture, foreign materials, and rodents.
 22. 20 feet (6 m) of cable going to and coming from each Splice Closure shall be coiled in the first pull box on each side of each closure. In addition, 50 feet (15 m) of cable shall be left coiled in the first pull box on each side of all surface mounted conduit systems.
 23. Where trunk cable terminations are left "dead ended", 100 feet (25 m) of cable shall be left coiled.
 24. All coiled cables shall be securely fastened in place with a minimum of four galvanized steel conduit straps.
 25. Fish line shall be installed in all communications ducts or conduits along with fiber optic communication cables. A 6ft. 6 in (2.0 m) length of fish line shall be left coiled, tied and accessible in each cabinet, vault, maintenance hole and junction box. The fish line shall be installed according to manufacturer specifications and shall be "free" and NOT helical about communications cables.

26. At intermediate pulling points, to prevent over tension on the cable, the cable shall be either taken up with an intermediate cable take up device as approved by the Engineer, or all excess cable shall be laid out on the ground in a figure eight configuration before subsequent installation.
27. Following installation in duct, a label shall be affixed to each cable end in a pull box or cable vault and the label shall contain the following information:
28. Customer order number
 - x. Reel number
 - xi. Ship date
 - xii. Manufactured date
 - xiii. Manufacturer's name
 - xiv. Cable designation as shown on the Drawings
 - xv. Length of cable to next reel-end splice point
 - xvi. Location of other end of cable (reel-end splice point)
 - xvii. Cable test data

D. Splicing

1. Splicing of the cable shall only be permitted at splice closure or field fiber optic interconnect panel locations as indicated in the Drawings, unless authorized by the Engineer.
2. The Contractor shall prepare for splicing the designated fibers of the cable to the Drop Cables connecting the communications equipment located in the Camera Hub and Mini-Hub cabinets. Sufficient cable shall be coiled in the vault/cabinet to allow for consumption during the splicing and to permit the splice closure to be removed from the vault/cabinet for future splicing.
3. At least 1.0m of each fiber shall be stored in the splice trays. The Contractor shall further splice all additional fibers provided in order to meet the fiber requirements specified in the Contract and including any fibers provided which are additional to the Contract requirements.

E. Testing

1. Test Documentation

- a. The Contractor shall be responsible for all testing and documentation required to establish approval and acceptance of this Item.
 - b. The Contractor shall submit test procedures and documented test results to the Engineer. The test procedures shall document the nature of test activities to be performed.
 - c. The test procedures shall be submitted to the Engineer prior to initiation of the testing. The procedures will be returned to the Contractor within two week indicating either “accepted” or “make corrections noted”. If corrections are required, the Contractor shall submit revisions within 1 week.
 - d. Four copies of the final test procedures shall be submitted to the Engineer prior to commencement of testing.
2. Pre-Installation Testing
- a. Reels of cable shall be tested for attenuation prior to installation in ducts. The Contractor shall measure and record the attenuation of 100% of the total single mode fibers on each reel. Attenuation shall meet or exceed the specified performance requirements in accordance with the Contract.
 - b. The Contractor shall ensure that specifications for the fiber optic cable are met prior to installation.
3. Proof of Performance Testing

- a. The Contractor shall measure the attenuation per kilometer of fiber in each length of cable after installation.
 - b. The Contractor shall measure the attenuation of a randomly selected minimum of 10% of the total single mode fibers, which will be connected to equipment.
 - c. All (100%) of optical fibers assigned to be spare or reserved shall be individually tested for optical attenuation.
 - d. The Contractor shall sequence the fibers which are to be measured after each pull, such that the same fibers are not measured on consecutive lengths.
 - e. The Contractor shall record the reel number from which the cable came, the identification of the fibers measured and the attenuation in dB/km of the fibers measured.
 - f. The Contractor shall measure and record the splice quality of each fusion splice performed. The Engineer shall be provided with access to interim results.
4. Optical Time Domain Reflectometer (OTDR) Testing
- a. The Contractor shall perform single mode Fiber OTDR testing after each cable has been installed.
 - b. The Contractor shall provide the Engineer with information regarding OTDR test equipment make and model with the equipment calibration procedures and certification dates prior to conducting the test routine.
 - c. An OTDR shall be used for backscattered light measurements. The OTDR shall operate at a nominal wavelength of 1310 nm and 1550 nm and shall include all necessary hardware required to couple it with single mode fiber.
 - d. The backscatter light measurement of each single mode fiber and each single mode optical link shall be measured in both directions and at both 1310 nm and 1550 nm wavelengths. Each single mode optical link shall be defined as being the total length of interconnected single mode fibers and the splices which form a continuous end-to-end optical link. This includes: CCTV Camera Hub to Mini-Hub, Mini-Hub to Main Fiber Hub and Main Fiber Hub to Newington Highway Operations Center (HOC).
 - e. The Contractor shall maintain a test result record of each single mode optical link and each single mode fiber by means of printer copy of the OTDR measured cable

attenuation profile. Single mode optical links shall be identified in the test results by identifying the fiber under test and by identifying the cabinet site or HOC Cabinet at which the OTDR was connected.

- f. The test results shall include the following measurements:
 - i. Total length of the single mode link
 - ii. Total attenuation of the single mode link
 - iii. Attenuation of each splice in the link under test
 - iv. Attenuation per kilometer of each interconnected fiber in the link under test
- g. Attenuation shall be measured in decibels referencing optical power.
- h. Each single mode fiber and splice tested shall be tested to meet the performance requirements in accordance with the Contract. Fiber strands failing this test shall be re-terminated and re-tested.

Method of Measurement

Work under this item shall be measured for payment by the number of linear feet of Fiber Optic Cable furnished and installed, as specified and shown on the Drawings.

Basis of Payment

The work to be done under this item shall be paid at the Contract unit price for each foot of the Fiber Optic Cable furnished and installed as described in this Specification. This work shall include all cable, connectors, equipment, materials and incidental items required to satisfy these Specifications.

ITEM #1114201A – AUXILIARY EQUIPMENT CABINET

Description:

Furnish and install an Auxiliary Equipment Cabinet (AEC), on a traffic control cabinet at the location shown on the plans and in accordance with the conditions set forth.

Materials:

- Conform to NEMA 3R enclosure specifications
- Type 5052-H32, 3.175mm (0.125") sheet aluminum
- Finish painted in accordance with the current D.O.T. specifications of Traffic Control Cabinets
- Seams continuously welded and ground smooth
- Dimensions as shown on D.O.T. Standard Sheets
- Door secured with Corbin lock - Ct. # 2.
- Continuous door hinge, 2.4mm (0.093") thick aluminum with 0.64mm (0.025") stainless steel hinge pin
- Door sealed with oil resistant gasket
- Back panel approximately 330mmH X 229mmW (13"H X 9"W)
- Rust and corrosion resistant mounting hardware
- Screened Vent

Construction Methods:

Mount the AEC on the left side of the controller cabinet, when facing the door. Confirm that the inside of the cabinet wall is clear, so that the installation of the AEC will not damage any equipment inside the controller cabinet. Drill a 25mm (1") hole in the back of the AEC and through the side of the controller cabinet. Install a close nipple through the 25mm (1") hole. Apply clear silicon caulk to both ends of the close nipple. Tighten lock-nuts and fiber bushings. Apply additional caulk if necessary to prevent moisture from entering controller cabinet and auxiliary equipment cabinet.

Method of Measurement:

This item shall be measured for payment by the actual number of Auxiliary Equipment Cabinets installed and accepted on traffic control cabinets.

Basis of Payment:

This item shall be paid for at the contract unit price each for "Auxiliary Equipment Cabinet" which price shall include mounting hardware, close nipple, insulated bushings, tools, and incidentals.

ITEM #1118012A – REMOVAL AND/OR RELOCATION OF TRAFFIC SIGNAL EQUIPMENT

Section 11.18: Replace the entire section with the following:

11.18.01 – Description:

Remove all abandon traffic signal equipment. Restore the affected area. Where indicated on the plans remove and reinstall existing traffic signal equipment to the location(s) shown.

11.18.02 – Materials:

The related sections of the following specifications apply to all incidental and additional material required for the proper relocation of existing equipment and the restoration of any area affected by this work.

- Division III, “Materials Section” of the Standard Specifications.
- Current Supplemental Specifications to the Standard Specifications.
- Applicable Special Provisions to the Standard Specifications.
- Current Department of Transportation, Functional Specifications for Traffic Control Equipment.

Article 11.18.03 - Construction Methods:

Schedule/coordinate the removal and/or relocation of existing traffic signal equipment with the installation of new equipment to maintain uninterrupted traffic signal control. This includes but is not limited to vehicle signals and detectors, pedestrian signals and pushbuttons, co-ordination, and pre-emption.

Abandoned Equipment

The contract traffic signal plan usually does not show existing equipment that will be abandoned. Consult the existing traffic signal plan for the location of abandoned material especially messenger strand, conduit risers, and handholes that are a distance from the intersection. A copy of the existing plan is usually in the existing controller cabinet. If not, a plan is available from the Division of Traffic Engineering upon request.

Unless shown on the plans it is not necessary to remove abandoned conduit in-trench and conduit under-roadway

When a traffic signal support strand, rigid metal conduit, down guy, or other traffic signal equipment is attached to a utility pole, secure from the pole custodian permission to work on the pole. All applicable Public Utility Regulatory Authority (PURA) regulations and utility company requirements govern. Keep utility company apprised of the schedule and the nature of the work.

Remove all abandoned hardware, conduit risers, and down guys, Remove anchor rods, to 6" (150mm) below grade.

When underground material is removed, backfill the excavation with clean fill material. Compact the fill to eliminate settling. Remove entirely the following material: pedestal foundation; controller foundation; handhole; pressure sensitive vehicle detector complete with concrete base. Unless otherwise shown on the plan, remove steel pole and mast arm foundation to a depth of 2 feet (600mm) below grade. Restore the excavated area to a grade and condition compatible with the surrounding area.

- If in an unpaved area apply topsoil and establish turf in accordance with Section 9.44 and Section 9.50 of the Standard Specifications.
- If in pavement or sidewalk, restore the excavated area in compliance with the applicable Sections of Division II, "Construction Details" of the Standard Specifications.

Relocated Equipment

In the presence of the Engineer, verify the condition of all material that will be relocated and reused at the site. Carefully remove all material, fittings, and attachments in a manner to safeguard parts from damage or loss. Replace at no additional cost, all material which becomes damaged or lost during removal, storage, or reinstallation.

Salvage Equipment

Salvage Material	Stock No.	Value
Controller Cabinet, Complete including but not limited to the following: Conflict Monitor Coordination Equipment Vehicle Detection Equipment	330-03-7010	\$ 500.00
Controller Unit	330-03-7005	\$ 500.00
Aluminum Pedestal 8 foot (2.4 m) 4 foot, 4 inch (1.3 m)	330-16-7108 330-16-7112	\$ 100.00 \$ 100.00
Steel Span Pole, 30' (9.0 m)	330-16-7050	\$ 250.00
Steel Span Pole, all other lengths	330-16-7016	\$ 250.00

All material not listed as salvage becomes the property of the Contractor. Properly handle, transport, then dispose in a suitable dump or recycle this material. Comply with all Federal and State hazardous waste laws and regulations.

In the presence of the Engineer, verify the condition and quantity of salvage material prior to removal. After removal transport and store the material protected from moisture, dirt, and other damage. Coil and secure copper cable separate from other cable such as galvanized support strand.

Within 4 working days of removal, return the State owned salvage material to the Department of Transportation Stores warehouse listed below. Supply all necessary manpower and

equipment to load, transport, and unload the material. The condition and quantity of the material after unloading will be verified by the Engineer.

DOT Salvage Store #134
660 Brook Street
Rocky Hill, CT

Contact Materials Management Salvage Coordinator, at (860) 258-1980, at least 24 hours prior to delivery.

Municipal Owned Traffic Signal Equipment

Return all municipal owned material such as pre-emption equipment to the Town.

Article 11.18.04 – Method of Measurement:

This work will be measured as a Lump Sum.

Article 11.18.05 – Basis of Payment:

This work will be paid for at the contract lump sum price for “Removal and/or Relocation of Traffic Signal Equipment” which price shall include relocating signal equipment and associated hardware, all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of signal equipment/materials designated for salvage and all equipment, material, tools and labor incidental thereto. This price shall also include removing and disposing of traffic signal equipment not to be salvaged and all equipment, material, tools and labor incidental thereto.

Payment is at the contract lump sum price for “Removal and/or Relocation of Traffic Signal Equipment” inclusive of all labor, vehicle usage, storage, and incidental material necessary for the complete removal of abandoned equipment/material and/or relocation of existing traffic signal equipment/material. Payment will also include the necessary labor, equipment, and material for the complete restoration of all affected areas.

A credit will be calculated and deducted from monies due the Contractor equal to the listed value of salvage material not returned or that has been damaged and deemed unsalvageable due to the Contractor’s operations.

Pay Item	Pay Unit
Removal and/or Relocation of Traffic Signal Equipment	L.S. (L.S.)

s:\traffic1406\signal specs\specs\1118012A-REMO & RELO T S EQUIP-Projects

ITEM #1118051A – TEMPORARY SIGNALIZATION (SITE NO. 1)

Description:

Provide Temporary Signalization (TS) at the intersections shown on the plans or as directed by the Engineer.

1. Existing Signalized Intersection: Keep each traffic signal completely operational at all times during construction through the use of existing signal equipment, temporary signal equipment, new signal equipment, or any combination thereof once TS has started as noted in the section labeled Duration.

2. Unsignalized Intersection: Provide TS during construction activities and convert the temporary condition to a permanent traffic signal upon project completion. Furnish, install, maintain, and relocate equipment to provide a complete temporary traffic signal, including but not limited to the necessary support structures, electrical energy, vehicle and pedestrian indications, vehicle and pedestrian detection, pavement markings, and signing.

Materials:

- Pertinent articles of the Standard Specifications
- Supplemental Specifications and Special Provisions contained in this contract

Construction Methods:

Preliminary Inspection

In the presence of the Engineer and a representative from the DOT Electrical Maintenance Office (Town representative for a Town owned signal), inspect and document the existing traffic signal's physical and operational condition prior to Temporary Signalization. Include but do not limit the inspection to the following:

- Controller Assembly (CA)
 - Controller Unit (CU)
 - Detection Equipment
 - Pre-emption Equipment
 - Coordination Equipment
- Vehicle and Pedestrian Signals
- Vehicle and Pedestrian Detectors
- Emergency Vehicle Pre-emption System (EVPS) *
- Interconnect Cable and Splice Enclosures
- Support Structures
- Handholes, Conduit and Cable

It may be necessary to repair or replace equipment that is missing, damaged, or malfunctioning. Develop a checklist of items for replacement or repair after the inspection. If authorized by the Engineer, this work will be considered "Extra Work" under Article 1.09.04.

* At a State owned signal the EVPS equipment is usually owned by the municipality. It is recommended to apprise the municipality of the inspection schedule and results.

TS Plan

At least 30 days prior to implementation of each stage, submit a 1:40 (1:500 metric) scale TS plan for each location to the Engineer for review and comment. Include but do not limit the plan to the following:

- Survey Ties
- Dimensions of Lanes, Shoulders, and Islands
- Slope Limits
- Clearing and Grubbing Limits
- Signal Phasing and Timing
- Location of Signal Appurtenances such as Supports, Signal Heads, Pedestrian Push buttons, Pedestrian Signals
- Location of Signing and Pavement Markings (stop bars, lane lines, etc.)
- Location, method, and mode of Temporary Detection

Review of the TS plan does not relieve the Contractor of ensuring the TS meets the requirements of the MUTCD. A copy of the existing traffic signal plan for State-owned traffic signals is available from the Division of Traffic Engineering upon request. Request existing traffic signal plans for Town-owned traffic signals from the Town. Do not implement the TS plan until all review comments have been addressed.

Earthwork

Perform the necessary clearing and grubbing and the grading of slopes required for the installation, maintenance, and removal of the TS equipment. After TS terminates restore the affected area to the prior condition and to the satisfaction of the Engineer.

Maintenance and Protection of Traffic

Furnish, install, maintain, relocate, and remove signal-related signing (lane-use, signal ahead, NTOR, etc.) and pavement markings as needed. Install, relocate, and/or remove equipment in a manner to cause no hazard to pedestrians, traffic or property. Maintain traffic as specified in the Special Provisions "Prosecution and Progress" and "Maintenance and Protection of Traffic."

Electrical Service and Telephone Service at Existing Signalized Intersections

If the electrical service or the telephone service source must be changed or relocated make all arrangements with the utility company and assume all charges. The party previously responsible for the monthly payment of service shall continue to be responsible during TS.

Electrical Service at Unsignalized Intersections

Assume all charges and make all arrangements with the power company, including service requests, scheduling, and monthly bills in accordance with Section 10.00.12 and Section 10.00.13 of the Standard Specifications. A metered service is recommended where TS equipment will be removed when no longer needed.

Temporary Signalization

Furnish, install, maintain, relocate, and remove existing, temporary, and proposed traffic signal equipment and all necessary hardware; modify or furnish a new CA; reprogram the CU

phasing and timing; as many times as necessary for each stage/phase of construction to maintain and protect traffic and pedestrian movements as shown on the plans or as directed by the Engineer.

Inspection

When requested by the Engineer, the TS will be subject to a field review by a representative of the Division of Traffic Engineering and/or the Town, which may generate additional comments requiring revisions to the temporary signal.

Detection

Provide vehicle detection on the existing, temporary, and/or new roadway alignment for all intersection approaches that have existing detection, that have detection in the final condition as shown on the signal plan, or as directed by the Engineer. Keep existing pedestrian pushbuttons accessible and operational at all times during TS. Temporary Detection is described and is paid for under Item # 11112XXA - Temporary Detection (Site No. X)

Emergency Vehicle Pre-emption System (EVPS)

Furnish, install, maintain, relocate, and remove the equipment necessary to keep the existing EVPS operational as shown on the plan. Do not disconnect or alter the EVPS without the knowledge and concurrence of the Engineer and the EVPS owner. Schedule all EVPS relocations so that the system is out of service only when the Contractor is actively working. Ensure EVPS is returned to service and is completely operational at the end of the work day. Keep the EVPS owner apprised of all changes to the EVPS.

Coordination

Furnish, install, maintain, relocate, and remove the equipment necessary to keep the intersection coordinated to adjacent signals as shown on the plan. Do not disconnect the interconnect without the approval of the Engineer.

- Closed Loop System: If it is necessary to disconnect the communication cable, notify the Engineer and the Bridgeport Operation Center (BOC) or the Newington Operation Center (NOC) prior to disconnect and also after it is reconnected.
- Time Base System: Program and synchronize all Time Clock/Time Base Coordination (TC/TBC) units as necessary.

Maintenance

Once TS is in effect, assume maintenance responsibilities of the entire installation in accordance with Section 1.07.12 of the Standard Specifications. Notify the Engineer for the project records the date that Temporary Signalization begins. Notify the following parties that maintenance responsibility has been transferred to the Contractor:

Signal Owner

CT DOT Electrical Maintenance Office or

Town Representative

Local Police Department

Provide the Engineer a list of telephone numbers of personnel who will be on-call during TS. Respond to traffic signal malfunctions by having a representative at the site within three hours from the initial contact. Within twenty-four (24) hours have the traffic signal operating according to plan.

If the Engineer determines that the nature of a malfunction requires immediate attention and/or the Contractor does not respond within three (3) hours, then an alternate maintenance service will be called to repair the signal. Expenses incurred by the alternate maintenance service for each call will be deducted from monies due to the Contractor with a minimum deduction of \$1,000. The alternate maintenance service may be the owner of the signal or another qualified electrical contractor.

Duration

Temporary Signalization shall commence when any existing signal equipment is disturbed, relocated, or altered based on the inspection checklist in any way for the TS.

For intersections with a State furnished controller, TS terminates when the inspection of the permanent signal is complete and operational and is accepted by the Engineer. For intersections with a Contractor furnished controller, Temporary Signalization terminates at the beginning of the 30 day test period for the permanent signal.

Ownership

Existing equipment, designated as salvage, remains the property of the owner. Salvable equipment will be removed and delivered to the owner upon completion of use. Temporary equipment supplied by the Contractor remains the Contractor's property unless noted otherwise.

Method of Measurement:

Temporary Signalization shall be paid only once per site on a percentage of the contract Lump Sum price. Fifty percent (50%) shall be paid when TS is operational as shown on the plan or to the satisfaction of the Engineer. Fifty percent (50%) shall be paid when TS terminates.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for "Temporary Signalization (Site No.)" for each site. This price includes the preliminary inspection, TS plan for each stage/phase, furnishing, installing, maintaining, relocating and revising traffic signal equipment, controller assembly modifications, controller unit program changes such as phasing and timing, removing existing, temporary, and proposed traffic signal equipment, arrangements with utility companies, towns or cities including the fees necessary for electric and telephone service, clearing and grubbing, grading, area restoration and all necessary hardware, materials, labor, and work incidental thereto.

All material and work for signing and pavement markings is paid for under the appropriate Contract items.

All material and work necessary for vehicle and pedestrian detection for TS is paid for under item 1111201A - Temporary Detection (Site No. 1).

All Contractor supplied items that will remain the Contractor's property shall be included in the contract Lump Sum price for "Temporary Signalization."

Any items installed as part of the permanent installation are not paid for under this item but are paid for under the bid item for that work.

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Signalization (Site No.)	L.S.

ITEM #1131002A – REMOTE CONTROL CHANGEABLE MESSAGE SIGN

Description: Work under this item shall include furnishing and maintaining a trailer-mounted, “Changeable Message Sign”, “Remote Control Changeable Message Sign”, “Changeable Message Sign with Radar”, or “Remote Control Changeable Message Sign with Radar” whichever is applicable, at the locations indicated on the plans or as directed by the Engineer.

Materials: The full matrix, internally illuminated variable message sign shall consist of a LED, fiber optic, lamp matrix, or hybrid magnetically operated matrix – LED message board; and a computer operated interface, all mounted on a towable, heavy duty trailer.

The sign shall have a minimum horizontal dimension of 115 inches and rotate a complete 360 degrees atop the lift mechanism.

In the raised position, the bottom of the sign shall be at least 7 feet above the roadway. The messages displayed shall be visible from a distance of 1/2 mile and be clearly legible from a distance of 900 feet during both the day and night.

The lighting system shall be controlled both manually and by a photocell for automatic sign dimming during nighttime use.

The sign shall be capable of storing a minimum of 100 preprogrammed messages and be able to display any one of those messages upon call from the trailer mounted terminal and/or through the cellular telephone hookup for the remote controlled sign.

The sign shall be a full matrix sign that is able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images (notwithstanding NTCIP limitations). The display shall be capable of producing arrow functions. Full- matrix displays shall allow the use of graphics, traffic safety symbols and various character heights.

Standard messages shall be displayed in a three-line message format with 8 characters per line. The letter height shall not be less than 18 inches.

The sign shall utilize yellow green for the display with a black background. Each matrix shall have a minimum size of 6 x 9 pixels. Each pixel shall utilize a minimum of four high output yellow green LEDs or equivalent light source. The LEDs or light source shall have a minimum 1.4 candela luminance intensity, 22 degrees viewing angle, and wavelength of 590 (+/- 3) nanometers.

For hybrid magnetically operated matrix – LED matrix, each pixel shall have one single shutter faced with yellow green retro-reflective sheeting with a minimum of four high output yellow green LEDs or equivalent light source. The hybrid magnetically operated matrix – LED matrix sign shall be capable of operating in three display modes; shutter only, LED only, and both LED

and shutter. These modes shall be automatically controlled by a photocell for day and night conditions and also capable of being manually controlled through the software.

The sign shall be controlled by an on-board computer. The sign shall automatically change to a preselected default message upon failure. That default message shall remain on display until the problem is corrected.

The sign shall include all necessary controls, including, but not limited to, personal computer, keyboard or alphanumeric hand-held keyboard, and software. The sign shall interface with PCs, cellular phones, and radar speed detection devices as required.

Controls shall be furnished for raising and lowering the message board, aligning the message board and, for solar powered units, a read-out of the battery bank charge.

Power shall be provided by a self-contained solar maintained power source or a diesel engine driven generator. Hardware for connection to a 110-volt power source shall also be provided.

Solar powered signs shall display programmed messages with the solar panel disconnected, in full night conditions, for a minimum of 30 consecutive days.

Remote Control Changeable Message Signs shall include one (1) industrial-grade cellular telephone and be equipped with a modem to control the sign and a security system to prevent unauthorized access. The security system shall allow access only through use of a code or password unique to that sign. If the proper code or password is not entered within 60 seconds of initial telephone contact, the call will be terminated. Remote control for the Remote Control Changeable Message Sign shall be by cellular telephone and touch tone modem decoder.

The radar equipped signs shall include a high-speed electronic control module (ECM-X), Radar SI transceiver, signal processing board and radar logging software.

The radar software will operate the sign in four modes:

- 1) The sign will display words "YOUR SPEED" followed by the speed (2 digits). The display will repeat the message as long as vehicles are detected. The sign will blank when no vehicles are present.
- 2) The sign will display a series of up to six messages (programmed by the user) when a preset speed (programmed by the user) is exceeded. The sign will blank when no vehicles are present.
- 3) Will perform like mode #2 with the addition of displaying the actual speed with it.
- 4) The sign will work as a standard Changeable Message Sign or Remote Control Changeable Message Sign with no radar.

Construction Methods: The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor. The cellular telephone required for the Remote Control Changeable Message Sign shall be provided to the Engineer for his use, and subsequently returned to the Contractor.

When the sign is not in use, it shall either be turned off with a blank display or turned from view.

Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

Method of Measurement: This work will be measured for payment for each "Changeable Message Sign", "Remote Control Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Control Changeable Message Sign with Radar", whichever applies, furnished and installed, for the number of calendar days that the sign is in place and in operation, measured to the nearest day. When a sign is in operation for less than a day, such a period of time shall be considered to be a full day regardless of actual time in operation.

Basis of Payment: This work will be paid for at the Contract unit price per day for each "Changeable Message Sign", "Remote Control Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Control Changeable Message Sign with Radar" which price shall include placing, maintaining, relocating and removing the sign and its appurtenances and all material, labor, tools and equipment incidental thereto. Additionally, for the "Remote Control Changeable Message Sign", or "Remote Control Changeable Message Sign with Radar", the cellular telephone service and telephone charges shall be included.

<u>Pay Item</u>	<u>Pay Unit</u>
Remote Control Changeable Message Sign	Day

ITEM #1206023A – REMOVAL AND RELOCATION OF EXISTING SIGNS

Section 12.06 is supplemented as follows:

Article 12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated side-mounted extruded aluminum and sheet aluminum signs, sign posts, sign supports, and foundations where indicated on the plans or as directed by the Engineer. Work under this item shall also include furnishing and installing new sign posts and associated hardware for signs designated for relocation.

Article 12.06.03 – Construction Methods is supplemented with the following:

The Contractor shall take care during the removal and relocation of existing signs, sign posts, and sign supports that are to be relocated so that they are not damaged. Any material that is damaged shall be replaced by the Contractor at no cost to the State.

Foundations and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Signing.

Sheet aluminum signs designated for relocation are to be re-installed on new sign posts.

Article 12.06.04 – Method of Measurement is supplemented with the following:

Payment under Removal and Relocation of Existing Signs shall be at the contract lump sum price which shall include all extruded aluminum and sheet aluminum signs, sign posts, and sign supports designated for relocation, all new sign posts and associated hardware for signs designated for relocation, all extruded aluminum signs, sheet aluminum signs, sign posts and sign supports designated for scrap, and foundations and other materials designated for removal and disposal, and all work and equipment required.

Article 12.06.05 – Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Signs” which price shall include relocating designated extruded aluminum and sheet aluminum signs, sign posts, and sign supports, providing new posts and associated hardware for relocated signs, removing and disposing of foundations and other materials, and all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of extruded aluminum signs, sheet aluminum signs, sign posts, and sign supports designated for scrap and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Signs	L.S.

ITEM #1210101A – 4” WHITE EPOXY RESIN PAVEMENT MARKINGS**ITEM #1210102A – 4” YELLOW EPOXY RESIN PAVEMENT MARKINGS****ITEM #1210105A – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS****ITEM #1210107A – 8” YELLOW EPOXY RESIN PAVEMENT MARKINGS**

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections titled “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥ 1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - mcd/ft²/fc (millicandelas per square meter per lux (mcd/m²/lux)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.
- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of 400 mcd/ft²/fc (mcd/m²/lux)

Yellow Epoxy: minimum retroreflectivity reading of 325 mcd/ft²/fc (mcd/m²/lux)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retro-reflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM #1302053A – RESET WATER GATE

Description

This work includes the resetting to grade of existing water valve boxes where shown on the Plans or where directed by the Engineer.

Materials

Only applicable if Contractor is replacing valve box damaged by the Contractor.

Valve boxes shall be 5-1/4", consisting of a base and adjustable slide type top section with cover. Valve boxes shall be made of centrifugally spun iron with 1/4" uniform wall thickness. Box cover shall have the word "WATER" cast on top. Valve boxes shall be coated with heavy bituminous coating and be manufactured in North America by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

Construction Methods

The existing valve box shall be removed and reset such that the top of the valve box is flush with the finish grade. The box shall be seated on a bedding of compacted granular fill to prevent lateral movement, rocking or settlement.

If the Contractor damages the existing valve box, then the Contractor shall replace the valve box at their expense. If the existing valve box was identified to the Engineer as damaged prior to the work, then the Town will furnish a new valve box.

Method of Measurement

Resetting of existing valve boxes where shown on the Plans or where directed by the Engineer will be measured for payment by the actual number of reset valve boxes completed and accepted.

Basis of Payment

Reset Water Gate shall include all equipment, tools, labor and materials incidental to complete the Work as specified.

ITEM #1403501A – RESET MANHOLE (SANITARY SEWER)

Work under this item shall conform to the requirements of Section 5.07 supplemented as follows:

Materials:

Add:

“Manhole frames and covers shall be the type and manufacturer indicated on the plans and details. The cover shall be cast with the wording indicated on the plans for the appropriate locations. Cast iron shall conform to ASTM A-48 Class 30B or its latest revisions. Frames and covers shall be coated with a bitumastic coating.”

Construction Methods:

Add:

“Manhole frames shall be set with the tops conforming to the finished grade of the pavement or ground surface or as directed by the Engineer.

Bricks shall be used as required, up to a maximum 12 inch height to adjust the manhole to this grade as shown on the drawings. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight.

A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange in all easements. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

The frame and cover of all existing manholes to be removed during the work shall be salvaged. Materials shall be delivered to the Sewer Division at the Sewer Line Maintenance Shop on Olcott Street. The contractor shall be responsible for properly unloading all salvaged materials. All other manhole components which are removed shall be properly disposed of by the Contractor.”

ITEM #1803060A – TYPE B IMPACT ATTENUATION SYSTEM (NON-GATING)

Description: Work under this item shall consist of furnishing, delivering, and installing a Non-Gating impact attenuation system for the site shown or as directed by the Engineer including reflective sheeting for delineation.

Performance Criteria: This attenuation system shall be a crash tested device having approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH).

Materials: The materials shall conform to the following requirements:

1. All materials for the impact attenuation system, including any transition sections and concrete backup walls, or pads, shall meet the Manufacturer's specification for the latest version of the attenuator chosen from the Department's Qualified Products List (Non-Gating) category and as depicted on the plans for a given length and width.
2. The Contractor shall submit a material certificate or certificate of compliance for each system supplied as defined in Article 1.06.07.
3. A Type III reflective sheeting shall be provided in conformance with Subarticle M18.09.01 and Connecticut Traffic Standard Sheet TR-1205_01, Sign #50-5032 or as provided by the Manufacturer.

Construction Methods: The impact attenuation system, transition and concrete pad, shall be installed in a neat and workman like manner at the location(s) shown on the plans and constructed in conformance with the Manufacturer's details. The reflective sheeting shall be installed on the nose of the impact attenuation system.

Failure to comply: In the event that, in the judgment of the Engineer, an impact attenuation system is not maintained adequately and/or safely on any part of the project, or the Contractor does not move or relocate traffic control devices to meet construction requirements for the safety of the traveling public when directed to do so by the Engineer, on any day, the sum of \$1500.00 per day will be deducted from any money due the Contractor as a charge for failure to comply with this specification.

Method of Measurement: The impact attenuation system will be measured for payment by the number of each system installed at the location shown on the plans in conformance with the Manufacturer's details and specifications as accepted by the Engineer.

Basis of Payment: The impact attenuation systems will be paid for at the Contract unit price for each "Type B Impact Attenuation System (Non-Gating)" as specified on the plans. This price shall include all materials, excavation, concrete pad, backup system, transition section, reflective sheeting, site preparation, and transportation, removal of surplus material, equipment, tools and labor incidental to complete the installation.

Pay Item
Type B Impact Attenuation System (Non-Gating)

Pay Unit
Each

PERMITS AND/OR SUPPLEMENTAL TO FORM 816 AND REQUIRED PROVISIONS

The following Permits and/or Supplemental to Form 816 and Required Provisions follow this page and are hereby made part of this Contract.

- **PERMITS AND/OR PERMIT APPLICATIONS**

CTDEEP Inland Wetlands and Watercourses Permit	Approved on May 2, 2015
Army Corps of Engineers Category 2 Permit	Approved on May 26, 2015
CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities	Registration Pending

- **SUPPLEMENTAL SPECIFICATIONS TO STANDARD SPECIFICATIONS FORM 816**

- **Construction Contracts - Required Contract Provisions (State Funded Only Contracts)**



**Inland Wetlands and Watercourses Permit &
Inland 401 Water Quality Certification**

Permittee: Connecticut Department of Transportation
2800 Berlin Turnpike
Newington, CT 06111

Attn: Mark W. Alexander, Assistant Transportation Planning Director

Permit No: IW-201411716, WQC-201411719

Town: Manchester

Project: DOT Project 76-193, Improvements to I-84 Eastbound Exit 63 Off Ramp and Intersection of Routes 30 & 83

Waters: Hockanum River and Unnamed Tributary Wetlands

Pursuant to Connecticut General Statutes Section 22a-39, the Commissioner of Energy and Environmental Protection ("Commissioner") hereby grants a permit to the Connecticut Department of Transportation ("the Permittee") to conduct regulated activities associated with the improvements to I-84 Eastbound Exit 63 off ramp and intersection of Routes 30 and 83. In addition, pursuant to Section 401 of the Federal Clean Water Act (33 USC 1341), Certification is hereby granted for activities, including but not limited to construction or operation of facilities, which may result in any discharge into the waters of the state associated with the above referenced project. The purpose of said activities is to improve the operation and safety at the intersection of Routes 30 and 83 with I-84 eastbound Exit 63 on/off ramps.

AUTHORIZED ACTIVITY

Specifically, the permittee is authorized to: Install temporary cofferdams within Hockanum River to perform water handling during construction of Bridge No. 05234, improve drainage and outlet protection associated with runoff draining from the exit 63 ramps and intersection, and place fill embankment in order to widen the route 83 approach.

The activities proposed will impact approximately 0.16 acres.

All activities shall be conducted in accordance with plans entitled: "*Environmental Permit Plans, Improvements on I-84 Exit 63 EB Off-Ramp and Intersection of Route 30 & Route 83, Town of Manchester, State Project No. 0076-0193*," prepared by the DOT Office of Engineering and submitted with the application on December 8, 2014.

This authorization constitutes the licenses and approvals required by Section 22a-39 and Section 401 of the Federal Clean Water Act (33 USC 1341).

This authorization is subject to and does not derogate any present or future property rights or other rights or powers of the State of Connecticut, conveys no property rights in real estate or material nor any exclusive privileges, and is further subject to any and all public and private rights and to any federal, state, or local laws or regulations pertinent to the property or activity affected thereby.

Said discharge(s) will comply with the applicable provisions of sections 301, 302, 303, 306 and 307 of the Federal Clean Water Act (33 USC 1311, 1312, 1313, 1316 and 1317, respectively) and will not violate Connecticut's Water Quality Standards.

The permittee's failure to comply with the terms and conditions of this permit shall subject the permittee, including the permittee's agents or contractor(s) to enforcement actions and penalties as provided by law.

This authorization is subject to the following conditions:

CONDITIONS:

1. **Expiration.** This permit shall expire 10 years from the date of this approval, except that Water Quality Certifications shall expire upon expiration of the U.S. Army Corps of Engineers (USACOE) Section 404 permit for the same activity.
2. **Construction Commencement and Completion.** If construction of any structures or facilities authorized herein is not completed within 5 years of issuance of this permit or within such other time as may be provided by this permit, or if any activity authorized herein is not commenced within 5 years of issuance of this permit or within such other time as may be provided by this permit, this permit shall expire 5 years after issuance or at the end of such time as may be authorized by the Commissioner.
3. **Notification of Project Initiation.** The permittee shall notify the Commissioner in writing two weeks prior to commencing construction or modification of structures or facilities authorized herein.
4. **De minimis Alteration.**

The permittee may not make any alterations, except de minimis alterations, to any structure, facility, or activity authorized by this permit unless the permittee applies for and receives a modification of this permit. A de minimis alteration means a change in the design, construction or operation authorized under this permit that does not increase environmental impacts or substantively alter the construction of the project as permitted.

5. **Maintenance of Structures.** All structures, facilities, or activities constructed, maintained, or conducted pursuant hereto shall be consistent with the terms and conditions of this permit, and any structure, facility or activity not specifically authorized by this permit, or exempted pursuant to section 22a-377 of the General Statutes or section 22a-377(b)-1 of the Regulations of Connecticut State Agencies, or otherwise exempt pursuant to other General Statutes, shall constitute a violation hereof which may result in modification, revocation or suspension of this permit or in the institution of other legal proceedings to enforce its terms and conditions.

Unless the permittee maintains in optimal condition any structures or facilities authorized by this permit, the permittee shall remove such structures and facilities and restore the affected waters to their condition prior to construction of such structures or facilities.

6. **Accuracy of Documentation.** In issuing this permit, the Commissioner has relied on information provided by the permittee. If such information was false, incomplete, or misleading, this permit may be modified, suspended or revoked and the permittee may be subject to any other remedies or penalties provided by law.
7. **Best Management Practices & Notification of Adverse Impact.** In constructing or maintaining any structure or facility or conducting any activity authorized herein, or in removing any such structure or facility under condition 5 hereof, the permittee shall employ best management practices to control storm water discharges, to prevent erosion and sedimentation, and to otherwise prevent pollution of wetlands and other waters of the State. Best Management Practices include, but are not limited, to practices identified in the *Connecticut Guidelines for Soil Erosion and Sediment Control* as revised, 2004 *Connecticut Stormwater Quality Manual*, Department of Transportation's *ConnDOT Drainage Manual* as revised, and the Department of Transportation Standard Specifications as revised.

The permittee shall immediately inform the Commissioner of any adverse impact or hazard to the environment which occurs or is likely to occur as the direct result of the construction, maintenance, or conduct of structures, facilities, or activities authorized herein.

8. **Reporting of Violations.** The permittee shall, no later than 48 hours after the permittee learns of a violation of this permit, report same in writing to the Commissioner. Such report shall contain the following information:
- a. the provision(s) of this permit that has been violated;
 - b. the date and time the violation(s) was first observed and by whom;
 - c. the cause of the violation(s), if known

- d. if the violation(s) has ceased, the duration of the violation(s) and the exact date(s) and times(s) it was corrected;
 - e. if the violation(s) has not ceased, the anticipated date when it will be corrected;
 - f. steps taken and steps planned to prevent a reoccurrence of the violation(s) and the date(s) such steps were implemented or will be implemented;
 - g. the signatures of the permittee and of the individual(s) responsible for actually preparing such report, each of whom shall certify said report in accordance with condition 12 of this permit.
9. **Material Storage in the Floodplain.** The storage of any materials at the site which are buoyant, hazardous, flammable, explosive, soluble, expansive, radioactive, or which could in the event of a flood be injurious to human, animal or plant life, below the elevation of the five-hundred (500) year flood is prohibited. Any other material or equipment stored at the site below said elevation by the permittee or the permittee's contractor must be firmly anchored, restrained or enclosed to prevent flotation. The quantity of fuel stored below such elevation for equipment used at the site shall not exceed the quantity of fuel that is expected to be used by such equipment in one day.
10. **Permit Transfer.** This permit is not transferable without the prior written consent of the Commissioner.
11. **Contractor Notification.** The permittee shall give a copy of this permit to the contractor(s) who will be carrying out the activities authorized herein prior to the start of construction and shall receive a written receipt for such copy, signed and dated by such contractor(s). The permittee's contractor(s) shall conduct all operations at the site in full compliance with this permit and, to the extent provided by law, may be held liable for any violation of the terms and conditions of this permit.
12. **Certification of Documents.** Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this permit shall be signed by the permittee or a responsible corporate officer of the permittee, a general partner of the permittee, and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows:

"I have personally examined and am familiar with the information submitted in this document and all attachments thereto and I certify that based on reasonable investigation, including my inquiry of the individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that a false statement in the submitted information may be punishable as a criminal offense in accordance with Section 22a-6 of the General

Statutes, pursuant to Section 53a-157b and in accordance with any other applicable statute.”

13. **Submission of Documents.** Any document or notice required to be submitted to the Commissioner under this permit shall, unless otherwise specified in writing by the Commissioner, be directed to:

Director, Inland Water Resources Division
Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

The date of submission to the Commissioner of any document required by this permit shall be the date such document is received by the Commissioner. The date of any notice by the Commissioner under this permit, including but not limited to notice of approval or disapproval on any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the Commissioner, whichever is earlier. Except as otherwise specified in this permit, the word "day" means any calendar day. Any document or action which is required by this permit to be submitted or performed by a date which falls on a Saturday, Sunday or legal holiday shall be submitted or performed by the next business day thereafter.

14. **Rights.** This permit is subject to and does not derogate any rights or powers of the State of Connecticut, conveys no property rights or exclusive privileges, and is subject to all public and private rights and to all applicable federal, state, and local law. In constructing or maintaining any structure or facility or conducting any activity authorized herein, the permittee may not cause pollution, impairment, or destruction of the air, water, or other natural resources of this State. The issuance of this permit shall not create any presumption that this permit should be renewed.
15. **In-stream Work.** Any unconfined in-stream work is restricted to the period from June 1 to September 30 inclusive.
16. **Protection of Eastern Box Turtles.** The permittee shall adhere to the following precautionary measures to protect turtles in the vicinity:
- a. install silt fencing around the work area prior to construction,
 - b. conduct a sweep of the work area after silt fencing is installed and prior to construction,

- c. the work crew must be apprised of the species description and possible presence and that the area be searched for turtles each day prior to construction,
 - d. any turtles that are discovered should be moved, unharmed, to an area immediately outside of the fenced area in the same direction that it was walking,
 - e. work conducted during the early morning (5am-10am) and evening hours (after 5pm) should occur with special care not to harm basking or foraging individuals,
 - f. no heavy machinery or vehicles should be parked in any turtle habitat, and
 - g. all silt fencing shall be removed after soils are stable so that reptile and amphibian movement between uplands and wetlands is not restricted.
- 17. Protection of Whiteriver Crayfish.** The permittee shall use best management practices to ensure that no siltation is released into the Hockanum River at the site.

Issued by the Commissioner of Energy and Environmental Protection on:

5/2/15
Date

Michael J. Sullivan
Michael J. Sullivan
Deputy Commissioner



DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

May 26, 2015

Regulatory Division
CENAE-R-PEB
Permit Number: **NAE-2014-2641**

Attn: Mr. Mark Alexander
Connecticut Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06131-7546

Dear Mr. Alexander:

We have reviewed your application to excavate/grade/place temporary and permanent fill in approximately 0.16 acres of wetlands/waters areas (3 sites) at the Hockanum River and adjacent wetlands in association with operational and safety improvements at the I-84 Exit 63 eastbound off-ramp and intersection of Route 30 and Route 83 in Manchester, Connecticut.

The work is described and shown on the enclosed plans entitled (title of cover sheet) "ENVIRONMENTAL PERMIT PLANS IMPROVEMENTS ON I-84 EXIT 63 EB OFF-RAMP AND INTERSECTION OF ROUTE 30 & ROUTE 83 TOWN OF MANCHESTER STATE PROJECT NO. 0076-0193", eight (8) sheets (Drawing Nos. PER-01 to PER-08), all sheets dated "12/1/2014" (plotted date).

The project involves realignment/widening and reconstruction of the I-84 eastbound Exit 63 off-ramp, including replacement of the bridge crossing over the Hockanum River with a wider crossing, and drainage modifications associated with the off ramp improvement. The Route 83 and 30 intersection at the terminus of the off-ramp will be widened/improved to accommodate the I-84 off-ramp improvements, and include drainage and road slope improvements along Route 83 in the vicinity of the off-ramp.

Based on the information you have provided, we have determined that the proposed activity, which includes a discharge of dredged or fill material into waters or wetlands, will have only minimal individual and cumulative impacts on waters of the United States, including wetlands. Therefore, this work is authorized as a Category 2 activity under the enclosed Federal permit known as the Connecticut General Permit (GP). This work must be performed in accordance with the terms and conditions of the GP.

You are responsible for complying with all of the GP's requirements. Please review the enclosed GP carefully; in particular the GP conditions, to be sure you understand its requirements. You should ensure that whoever does the work also fully understands the requirements and that a copy of the permit document and this authorization letter are at the project site throughout the time the work is being performed.

The Connecticut Department of Energy & Environmental Protection (DEEP) has issued a Water Quality Certification (WQC) for this project, as required under Section 401 of the Clean Water Act, based on their review of the project.

This authorization expires on July 15, 2016, unless the GP is modified, suspended, or revoked before then. You must commence or be under contract to commence the work authorized herein by that expiration date and complete the work by July 15, 2017. If not, you must contact this office to determine the need for further authorization *before* beginning or continuing the activity. We recommend you contact us before this permit expires to discuss a permit reissuance.

If you change the plans or construction methods for work within our jurisdiction, please contact us immediately to discuss modification of this authorization. This office must approve any changes before you undertake them.

This authorization requires you to complete and return the enclosed Work Start Notification Form to this office at least two weeks before the anticipated starting date. You must also complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work (and any required mitigation).

This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law, as listed on Page 2 of the GP. Performing work not specifically authorized by this determination or failing to comply with any special condition(s) and all the terms and conditions of the GP may subject you to the enforcement provisions of our regulations.

This authorization presumes that the work as described above and as shown on your plans noted above is in waters of the U.S. Should you desire to appeal our jurisdiction, please submit a request for an approved jurisdictional determination in writing to this office.

We continually strive to improve our customer service. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Please contact Susan Lee of my staff at (978) 318-8494 if you have any questions.

Sincerely,



Robert J. DeSista
Chief, Permits & Enforcement Branch
Regulatory Division

Enclosures

Copy Furnished (via email): Bob Gilmore, CT DEEP- IWRD; Nate Margason, US EPA

**INTERDEPARTMENTAL
MESSAGE**

STATE OF CONNECTICUT

To	NAME, TITLE Central Permit Processing Unit, 1 ST Floor	DATE 12/3/2014
	AGENCY, ADDRESS Department of Energy and Environmental Protection, 79 Elm Street, Hartford	
From	NAME, TITLE Mark Alexander, Assistant Transportation Planning Director	TELEPHONE (860) 594-2931
	AGENCY, ADDRESS Department of Transportation, 2800 Berlin Turnpike, Newington, CT	

Subject: State Project No. 76-193
Improvements on I-84 Exit 63 Off-Ramp and Intersection of Routes 30 & 83
Town of Manchester

Attached are an original and 2 hard copies of the request for Inland Wetlands & Watercourses and 401 Water Quality Certification permit authorization associated with the above referenced project.

Should you have any questions or need additional information regarding this matter, please contact Mr. Andrew H. Davis, Transportation Supervising Planner of my staff, at (860) 594-2157.

Attachments

Camil Zuk

cc: Robbin L. Cabelus - Mark Alexander
Andrew H. Davis – Kevin F. Carifa – Christopher W. Samorajczyk
Timothy M. Wilson – William W. Britnell – Matthew R. Vail
Ravi V. Chandran – Dean P. Cerasoli
Michael E. Masayda



Statewide Inland Wetlands & Watercourses Activity Reporting Form

*Please complete and mail this form in accordance with the instructions on pages 2 and 3 to:
Wetlands Management Section, Inland Water Resources Division, CT DEEP, 79 Elm Street – 3rd Floor, Hartford, CT 06106*

PART I: To Be Completed By the Municipal Inland Wetlands Agency Only

1. DATE ACTION WAS TAKEN: Year Click Here for Year Month Click Here for Month
2. ACTION TAKEN: Click Here to Choose a Code
3. WAS A PUBLIC HEARING HELD (check one)? Yes ☐ No ☐
4. NAME OF AGENCY OFFICIAL VERIFYING AND COMPLETING THIS FORM:
(type name) _____ (signature) _____

PART II: To Be Completed By the Municipal Inland Wetlands Agency or the Applicant

5. TOWN IN WHICH THE ACTION IS OCCURRING (type name): Manchester
Does this project cross municipal boundaries (check one)? Yes ☐ No ☒
If Yes, list the other town(s) in which the action is occurring (type name(s)): _____, _____
6. LOCATION (click on hyperlinks for information): USGS Quad Map Name: _____ or Quad Number: 38
Subregional Drainage Basin Number: 4500
7. NAME OF APPLICANT, VIOLATOR OR PETITIONER (type name): Thomas J. Maziarz - Bureau Chief
8. NAME & ADDRESS/LOCATION OF PROJECT SITE (type information): I-84 EB Exit 63 On/Off-Ramp and Intersection of Routes 30 & 83
Briefly describe the action/project/activity (check and type information): Temporary ☒ Permanent ☒ Description: Off-ramp bridge replacement to remediate queued vehicles backing up onto I-84 by increasing storage capacity. Temporary impacts resulting from construction totalling 0.113 acres.
9. ACTIVITY PURPOSE CODE: N
10. ACTIVITY TYPE CODE(S): 1, 2, 9, Click for Code
11. WETLAND / WATERCOURSE AREA ALTERED (type in acres or linear feet as indicated):
Wetlands: .042 acres Open Water Body: 0.00 acres Stream: 0.00 linear feet
12. UPLAND AREA ALTERED (type in acres as indicated): 0.00 acres
13. AREA OF WETLANDS / WATERCOURSES RESTORED, ENHANCED OR CREATED (type in acres as indicated): 0.00 acres

DATE RECEIVED:

PART III: To Be Completed By the DEEP

DATE RETURNED TO DEEP:

FORM COMPLETED: YES NO

FORM CORRECTED / COMPLETED: YES NO

79 Elm Street • Hartford, CT 06106-5127

www.ct.gov/deep

Affirmative Action/Equal Opportunity Employer



Connecticut Department of
Energy & Environmental Protection

CPPU USE ONLY

App #: _____

Doc #: _____

Check #: _____

Permit Application Transmittal Form

Please complete this transmittal form in accordance with the instructions in order to ensure the proper handling of your application(s) and the associated fee(s). Print legibly or type.

Part I: Applicant Information:

- *If an applicant is a corporation, limited liability company, limited partnership, limited liability partnership, or a statutory trust, it must be registered with the Secretary of State. If applicable, applicant's name shall be stated exactly as it is registered with the Secretary of State.*
- *If an applicant is an individual, provide the legal name (include suffix) in the following format: First Name; Middle Initial; Last Name; Suffix (Jr, Sr., II, III, etc.).*

Applicant: **Connecticut Department of Transportation**

Mailing Address: **2800 Berlin Turnpike**

City/Town: **Newington**

State: **CT**

Zip Code: **06111**

Business Phone: **860-594-2931**

ext.: _____

Fax: **860-594-3028**

Contact Person: **Mark W. Alexander**

Phone: **860-594-2931** ext. _____

E-Mail: **Mark.W.Alexander@ct.gov**

Applicant (check one): ☐ individual ☐ *business entity ☐ federal agency ☒ state agency ☐ municipality ☐ tribal

*If a business entity, list type (e.g., corporation, limited partnership, etc.):

☐ Check if any co-applicants. If so, attach additional sheet(s) with the required information as supplied above.

Please provide the following information to be used for *billing purposes only*, if different:

Company/Individual Name:

Mailing Address:

City/Town:

State:

Zip Code:

Contact Person:

Phone:

ext. _____

Part II: Project Information

Brief Description of Project: *(Example: Development of a 50 slip marina on Long Island Sound)*

Improvements on I-84 EB Exit 63 On/Off-Ramp and Intersection of Routes 30 & 83

Location (City/Town): **Manchester**

Other Project Related Permits (*not* included with this form):

Permit Description	Issuing Authority	Submittal Date	Issuance Date	Denial Date	Permit #
PGP Category II	ACOE		Pending		

Part III: Individual Permit Application and Fee Information

New, Mod. or Renew	Individual Permit Applications	Initial Fees	No. of Permits Applied For	Total Initial Fees	Original + Required Copies
	AIR EMISSIONS				
	New Source Review	\$940.00			1 + 0
	Title V Operating Permits	none			1 + 0
	Title IV	none			1 + 0
	Clean Air Interstate Rule (CAIR)	none			1 + 0
	WATER DISCHARGES				
	To Groundwater	\$1300.00			1 + 1
	To Sanitary Sewer (POTW)	\$1300.00			1 + 1
	To Surface Water (NPDES)	\$1300.00			1 + 2
	INLAND WATER RESOURCES-multiple permits 1 + 6 total copies				
	Dam Construction	none			1 + 2
	Flood Management Certification	none			1 + 1
	Inland 401 Water Quality Certification	none	1		1 + 5
	Inland Wetlands and Watercourses	none	1		
	Stream Channel Encroachment Lines	★			
	Water Diversion	★			1 + 5
	OFFICE OF LONG ISLAND SOUND PROGRAMS				
	Certificate of Permission	\$375.00			1 + 3
	Coastal 401 Water Quality Certification	none			1 + 3
	Structures and Dredging/Tidal Wetlands	\$660.00			1 + 3
	WASTE MANAGEMENT				
	Aerial Pesticide Application	★			1 + 2
	Aquatic Pesticide Application	\$200.00			1 + 0
	CGS Section 22a-454 Waste Facilities	★			1 + 1
	Hazardous Waste Treatment, Storage and Disposal Facilities	★			1 + 1
	Marine Terminal License	\$125.00			1 + 0
	Stewardship	\$4000.00			1 + 1
	Solid Waste Facilities	★			1 + 1
	Waste Transportation	★			1 + 0
		Subtotal ➡			
GENERAL PERMITS and AUTHORIZATIONS		Subtotals Page 3 ➡			
Enter subtotals from Part IV, pages 3 & 4 & 5 of this form		Subtotals Page 4 ➡			
		Subtotals Page 5 ➡			
		TOTAL ➡	2		
<input type="checkbox"/> Indicate whether municipal discount or state waiver applies. Less Applicable Discount ➡				100%	
		AMOUNT REMITTED ➡		0	
Check # ➡		Check or money order should be made payable to: "Department of Energy and Environmental Protection"			

★ See fee schedule on individual application.

Part IV: General Permit Registrations and Requests for Other Authorizations
Application and Fee Information

✓ General Permits and Other Authorizations	Initial Fees	No. of Permits Applied For	Total Initial Fees	Original + Required Copies
AIR EMISSIONS				
<input type="checkbox"/> Limit Potential to Emit from Major Stationary Sources of Air Pollution	\$2760.00			1 + 0
<input type="checkbox"/> Ionizing Radiation Registration	\$200.00			1 + 0
<input type="checkbox"/> Emergency/Temporary Authorization	★ ★			★ ★
<input type="checkbox"/> Other, (please specify):				
WATER DISCHARGES				
<input type="checkbox"/> Domestic Sewage	\$500.00			1 + 0
<input type="checkbox"/> Food Processing Wastewater	\$500.00			1 + 0
<input type="checkbox"/> Groundwater Remediation Wastewater to a Sanitary Sewer	\$500.00			1 + 0
<input type="checkbox"/> Groundwater Remediation Wastewater to a Surface Water Registration Only	\$625.00			1 + 0
<input type="checkbox"/> Approval of Registration by DEP	\$1250.00			
<input type="checkbox"/> Hydrostatic Pressure Testing Wastewater Registration Only	\$625.00			1 + 0
<input type="checkbox"/> Approval of Registration by DEP (natural gas pipelines)	\$1250.00			
<input type="checkbox"/> Miscellaneous Discharges of Sewer Compatible Wastewater Flow < 5,000 gpd and fire sprinkler system testwater	\$625.00			1 + 1
<input type="checkbox"/> Flow > 5,000 gpd	\$1250.00			
<input type="checkbox"/> Non-Contact Cooling and Heat Pump Water (Minor)	\$625.00			1 + 1
<input type="checkbox"/> Photographic Processing Wastewater (Minor)	\$100.00			1 + 0
<input type="checkbox"/> Printing & Publishing Wastewater (Minor) Flow < 40 gpd	\$500.00 \$100.00			1 + 0
<input type="checkbox"/> Stormwater Associated with Commercial Activities	\$500.00			1 + 0
<input type="checkbox"/> Stormwater Associated with Industrial Activities <500 employees-see general permit for additional requirements >500 employees-see general permit for additional requirements	\$500.00 \$1000.00			1 + 0
<input type="checkbox"/> Stormwater & Dewatering Wastewaters-Construction Activities 5 - 10 acres	\$625.00			1 + 0
<input type="checkbox"/> > 10 acres	\$1250.00			
<input type="checkbox"/> Stormwater from Small Municipal Separate Storm Sewer Systems (MS4)	\$250.00			1 + 0
<input type="checkbox"/> Swimming Pool Wastewater - Public Pools and Contractors	\$500.00			1 + 0
<input type="checkbox"/> Tumbling or Cleaning of Parts Wastewater (Minor)	\$1000.00			1 + 1
<input type="checkbox"/> Vehicle Maintenance Wastewater Registration Only	\$625.00			1 + 0
<input type="checkbox"/> Approval of Registration by DEP	\$1250.00			
<input type="checkbox"/> Water Treatment Wastewater	\$625.00			1 + 0
<input type="checkbox"/> Emergency/Temporary Authorization - Discharge to POTW	\$1500.00			1 + 0
<input type="checkbox"/> Emergency/Temporary Authorization - Discharge to Surface Water	\$1500.00			1 + 0
<input type="checkbox"/> Emergency/Temporary Authorization - Discharge to Groundwater	\$1500.00			1 + 0
<input type="checkbox"/> Other, (please specify):				
Note: Carry subtotals over to Part III, page 2 of this form. Subtotal				

★ ★ Contact the specific permit program for this information (Contact numbers are provided in the instructions).

Part IV: General Permit Registrations and Requests for Other Authorizations (continued)

✓ General Permits and Other Authorizations	Initial Fees	No. of Permits Applied For	Total Initial Fee	Original + Required Copies
AQUIFER PROTECTION PROGRAM				
<input type="checkbox"/> Registration for Regulated Activities	\$625.00			1 + 0
<input type="checkbox"/> Permit Application to Add a Regulated Activity	\$1250.00			1 + 0
<input type="checkbox"/> Exemption Application from Registration	\$1250.00			1 + 0
INLAND WATER RESOURCES				
<input type="checkbox"/> Dam Safety Repair and Alteration	\$1000.00			1 + 2
<input type="checkbox"/> Diversion of Water for Consumptive Use: Reauthorization Categories	\$1000.00			1 + 2
<input type="checkbox"/> Diversion of Water for Consumptive Use: Authorization Required	\$2500.00			1 + 5
<input type="checkbox"/> Diversion of Water for Consumptive Use: Filling Only	\$1500.00			1 + 4
<input type="checkbox"/> Habitat Conservation	\$1000.00			1 + 2
<input type="checkbox"/> Lake, Pond and Basin Dredging	\$1000.00			1 + 2
<input type="checkbox"/> Minor Grading	\$1000.00			1 + 2
<input type="checkbox"/> Minor Structures	\$1000.00			1 + 2
<input type="checkbox"/> Utilities and Drainage	\$1000.00			1 + 2
<input type="checkbox"/> Emergency/Temporary Authorization	★ ★			★ ★
<input type="checkbox"/> Other, (please specify):				
OFFICE OF LONG ISLAND SOUND PROGRAMS				
<input type="checkbox"/> 4/40 Docks	\$700.00			1 + 1
<input type="checkbox"/> Beach Grading	\$100.00			1 + 1
<input type="checkbox"/> Coastal Remedial Activities Required by Order	\$700.00			1 + 1
<input type="checkbox"/> Dock Reconstruction	\$300.00			1 + 1
<input type="checkbox"/> Marina and Mooring Field Reconfiguration	\$700.00			1 + 1
<input type="checkbox"/> Non-harbor Moorings	\$100.00			1 + 1
<input type="checkbox"/> Osprey Platforms and Perch Poles	none			1 + 1
<input type="checkbox"/> Pump-out Facilities (no fee for Clean Vessel Act grant recipients)	\$100.00			1 + 1
<input type="checkbox"/> Removal of Derelict Structures	\$100.00			1 + 1
<input type="checkbox"/> Residential Flood Hazard Mitigation	\$100.00			1 + 1
<input type="checkbox"/> Swim Floats	\$100.00			1 + 1
<input type="checkbox"/> Emergency/Temporary Authorization	★ ★			★ ★
<input type="checkbox"/> Other, (please specify):				
Note: Carry subtotals over to Part III, page 2 of this form.		Subtotal		

★ See fee schedule on registration/application.

★★ Contact the specific permit program for this information.

Part IV: General Permit Registrations and Requests for Other Authorizations (continued)

✓ General Permits and Other Authorizations	Initial Fees	No. of Permits Applied For	Total Initial Fee	Original + Required Copies
WASTE MANAGEMENT				
<input type="checkbox"/> Addition of Grass Clippings at Registered Leaf Composting Facilities	\$500.00			1 + 0
<input type="checkbox"/> Asbestos Disposal Authorization	\$300.00			1 + 0
Certain Recycling Facilities				
<input type="checkbox"/> Drop-site Recycling Facility	\$200.00			1 + 0
<input type="checkbox"/> Limited Processing Recycling Facility	\$500.00			1 + 0
<input type="checkbox"/> Recyclables Transfer Facility	\$500.00			1 + 0
<input type="checkbox"/> Single Item Recycling Facility	\$500.00			1 + 0
<input type="checkbox"/> Contaminated Soil and/or Staging Management (Staging/Transfer) Registration Only	\$250.00			1 + 0
<input type="checkbox"/> Approval of Registration by DEP	\$1500.00			1 + 0
<input type="checkbox"/> Connecticut Solid Waste Demonstration Project	\$1000.00			1 + 0
<input type="checkbox"/> Disassembling Used Electronics	\$400.00			1 + 0
<input type="checkbox"/> Leaf Composting Facility	none			1 + 1
<input type="checkbox"/> Municipal Transfer Station	\$800.00			1 + 1
<input type="checkbox"/> One Day Collection of Certain Wastes and Household Hazardous Waste	\$1000.00			1 + 0
<input type="checkbox"/> Special Waste Authorization	\$660.00			1 + 0
<input type="checkbox"/> Storage and Distribution of Two (2) Inch Nominal Tire Chip Aggregate	\$500.00			1 + 0
<input type="checkbox"/> Storage and Processing of Asphalt Roofing Shingle Waste and/or Storage and Distribution of Ground Asphalt Aggregate	★			1 + 0
<input type="checkbox"/> Storage and Processing of Scrap Tires for Beneficial Use	\$1000.00			1 + 0
<input type="checkbox"/> Emergency/Temporary Authorization	★★			★★
<input type="checkbox"/> Other, (please specify):				
REMEDIATION				
<input type="checkbox"/> In Situ Groundwater Remediation: Enhance Aerobic Biodegradation	★			1 + 2
Note: Carry subtotals over to Part III, page 2 of this form. Subtotal ➡				

★See fee schedule on registration/application.

★★Contact the specific permit program for this information.

The Department of Energy and Environmental Protection is an affirmative action/equal opportunity employer and service provider. In conformance with the Americans with Disabilities Act, DEEP makes every effort to provide equally effective services for persons with disabilities. Individuals with disabilities who need this information in an alternative format, to allow them to benefit and/or participate in the agency's programs and services, should call 860-424-3035 or e-mail the ADA Coordinator at DEP.aaooffice@ct.gov. Persons who are hearing impaired should call the State of Connecticut relay number 711.



Permit Application for Programs Administered by the Inland Water Resources Division

Please complete this application form in accordance with the instructions (DEP-IWRD-INST-100) in order to ensure the proper handling of your application. Print or type unless otherwise noted. You must submit the *Permit Application Transmittal Form* (DEP-APP-001) and the initial fee along with this form.

DEP USE ONLY

Part I: Application Type

Check the appropriate box identifying the application type.

This application is for (check one):

- ☒ A new application
☐ A renewal of an existing permit
☐ A modification of an existing permit

Please identify any previous or existing permit/authorization/registration number in the space provided.

Existing permit/authorization/registration number:

Expiration Date:

Part II: Permit Type and Fee Information

Please note: effective August 21, 2003, the application fees for the programs administered by the Inland Water Resources Division have increased as listed in the following table. The fee for municipalities is 50% of the listed rates.

Type of Permit (check <i>all</i> that apply):	Fee to submit with application:
<input checked="" type="checkbox"/> Inland Wetlands & Watercourses CGS Sec. 22a-36 et seq.	none
<input type="checkbox"/> Dam Construction CGS Sec. 22a-403	none
<input checked="" type="checkbox"/> 401 Water Quality Certificate 33 U.S.C. 1341	none
<input type="checkbox"/> Flood Management Certification CGS Sec. 25-68(b) - (h)	none
Stream Channel Encroachment CGS Sec. 22a-342	
<input type="checkbox"/> No change in grade and no construction of above-ground structures	\$470.00
<input type="checkbox"/> A change in grade and no construction of above-ground structures	\$940.00
<input type="checkbox"/> A change in grade and above-ground structures or buildings	\$4,000.00
Water Diversion: Consumptive Use CGS Sec. 22a-372(e)	
<input type="checkbox"/> Withdrawal > 0.05 and < 0.5 mgd	\$2,050.00
<input type="checkbox"/> Withdrawal ≥ 0.5 and < 2.0 mgd	\$4,000.00
<input type="checkbox"/> Withdrawal ≥ 2.0 mgd	\$6,250.00
Water Diversion: Nonconsumptive Use CGS Sec. 22a-372(e)	
<input type="checkbox"/> Watershed < 0.5 sq mi	\$2,050.00
<input type="checkbox"/> Watershed ≥ 0.5 sq mi and < 2.0 sq mi	\$4,000.00
<input type="checkbox"/> Watershed ≥ 2.0 sq mi	\$6,250.00

Part III: Applicant Information

1. Fill in the name of the applicant(s) as indicated on the *Permit Application Transmittal Form* (DEP-APP-001):

Applicant: **Connecticut Department of Transportation**

Phone: **(860) 594-2931**

ext.

Fax: **(860) 594 - 3028**

- ☐ Check here if there are co-applicants. If so, label and attach additional sheet(s) with the required information to this sheet.

2. Applicant's interest in property at which the proposed activity is to be located:

☒ site owner

☐ option holder

☐ lessee

☐ easement holder

☐ operator

☐ other (specify):

3. List primary contact for departmental correspondence and inquiries, if different than the applicant.

Name: **Connecticut Department of Transportation**

Mailing Address: **2800 Berlin Turnpike**

City/Town: **Newington**

State: **CT**

Zip Code: **06111**

Business Phone: **(860) 594-2931**

ext.

Fax: **(860) 594 - 3028**

Contact Person: **Mark W. Alexander**

Title: **Transp. Assistant Planning Director**

4. List attorney or other representative, if applicable:

Firm Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.

Fax:

Attorney:

5. Facility or Property Owner, if different than the applicant:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.

Fax:

Contact Person:

Title:

Home address of owner (for Inland Wetlands applications only):

Mailing Address:

City/Town:

State:

Zip Code:

Home Phone:

Part III: Applicant Information (continued)

6. List any engineer(s) or other consultant(s) employed or retained to assist in preparing the application or in designing or constructing the activity. ☐ Check here if additional sheets are necessary, and label and attach them to this sheet.

Name: **Connecticut Department of Transportation**

Mailing Address: **2800 Berlin Turnpike**

City/Town: **Newington**

State: **CT**

Zip Code: **06111**

Business Phone: **860-594-3342**

ext.

Fax: **860-594-3375**

Contact Person: **Matthew R. Vail**

Title: **Project Manager**

Service Provided: **Application Preparation & Engineering**

Part IV: Site Information

1. Site Location:

- a. Name of facility, if applicable: **I-84 EB Exit 63 On/Off-Ramp and Intersection of Routes 30 & 83**
Street Address or Description of Location: **At the Intersection of I-84 eastbound Exit 63 off-ramp (MP-71.60) and Routes 30 (MP-6.17) and 83 (MP-10.14) in the Town of Manchester**
City/Town: **Manchester** State: **CT** Zip Code: **06042**
Project No., if applicable: **0076-0193**
- b. Tax Assessor's Reference: Map Block Lot
(Assessor's reference is not required if requester is an agency of the State of Connecticut.)
- c. Latitude and Longitude of the approximate "center of the site" in *degrees, minutes, and seconds*:
Latitude: **N: 41.811** Longitude: **E: -72.518**
Method of determination (check one):
☐ GPS ☒ USGS Map ☐ Other (please specify):
If a USGS Map was used, provide the quadrangle name: **38 Manchester**
- d. Drainage Basin number(s) wherein the proposed activity will take place: **4500**
- e. Flood Insurance Rate Map Panel Number: **09003C0392F**
Date of the map referenced: **09/26/2008**
- f. If applying for a SCEL permit, identify the property wherein the proposed activity will take place by indicating the following:
SCEL Map number(s): **N/A**
Property Identifier:
Date of the map referenced:

2. **COASTAL BOUNDARY:** Is the activity which is the subject of this application located within the coastal boundary as delineated on DEP approved coastal boundary maps? ☐ Yes ☒ No
If yes, and this application is for a new permit or for a modification of an existing permit, you must submit a *Coastal Consistency Review Form* (DEP-APP-004) with your application as Attachment P.
Information on the coastal boundary is available at the local town hall or on the "Coastal Boundary Map" available at DEP Maps and Publications (860-424-3555).

Part IV: Site Information (continued)

3. **ENDANGERED OR THREATENED SPECIES:** Is the project site located within an area identified as a habitat for endangered, threatened or special concern species as identified on the "State and Federal Listed Species and Natural Communities Map"? ☐ Yes ☒ No Date of Map: **June 2014**

If yes, complete and submit a *Connecticut Natural Diversity Data Base (CT NDDB) Review Request Form* (DEP-APP-007) to the address specified on the form. **Please note NDDB review generally takes 4 to 6 weeks and may require additional documentation from the applicant. DEP strongly recommends that applicants complete this process before submitting the subject application.**

When submitting this application form, include copies of any correspondence to and from the NDDB, including copies of the completed *CT NDDB Review Request Form*, as Attachment K (Environmental Report) or in Attachment Q if no environmental report is required.

For more information visit the DEP website at www.ct.gov/dep/endorangeredspecies (Review/Data Requests) or call the NDDB at 860-424-3011.

4. **AQUIFER PROTECTION AREAS:** Is the site located within a town required to establish Aquifer Protection Areas, as defined in section 22a-354a through 354bb of the General Statutes (CGS)?

☐ Yes ☒ No

If yes, is the site within an area identified on a Level A or Level B map? ☐ Yes ☐ No

To view the applicable list of towns and maps visit the DEP website at www.ct.gov/dep/aquiferprotection

To speak with someone about the Aquifer Protection Areas, call 860-424-3020.

5. **CONSERVATION OR PRESERVATION RESTRICTION:** Is the property subject to a conservation or preservation restriction? ☐ Yes ☒ No

If Yes, proof of written notice of this application to the holder of such restriction or a letter from the holder of such restriction verifying that this application is in compliance with the terms of the restriction, must be submitted as Attachment Q.

6. **Other Permits:** List any previous federal, state or local permits or certificates that have already been issued for the site or for the proposed activity:

<u>Type or Nature of Permit</u>	<u>Permit No.</u>	<u>Issuing Authority</u>	<u>Date Issued</u>	<u>Expiration Date</u>	<u>Permittee Name</u>
Flood Mgmt General	CTDOT		6/16/2014	N/A	Thomas J. Marziarz

Part V: Supporting Documents

Please check the attachments submitted as verification that *all* applicable attachments have been submitted with this application form. When submitting any supporting documents, please label the documents as indicated in this part (e.g., Attachment A, etc.) and be sure to include the applicant's name as indicated on the *Permit Application Transmittal Form*. The specific information required in each attachment is described in the *Instructions for Completing A Permit Application for Inland Water Resources Division Activities* (DEP-IWRD-INST-100).

- ☒ Attachment A: Executive Summary
- ☒ Attachment B: An 8 1/2" x 11" copy of a United States Geological Survey (USGS) Topographic Quadrangle Map (scale: 1:24,000) with the regulated activity or project site outlined or pinpointed, as appropriate.
- ☒ Attachment C: *Documentation Form for: Inland Wetlands and Watercourses Permit, Stream Channel Encroachment Line Permit, and 401 Water Quality Certification* (DEP-IWRD-APP-101)

Part V: Supporting Documents (continued)

- ☐ Attachment D: *Documentation Form for Water Diversion Permit* (DEP-IWRD-APP-102)
- ☐ Attachment E: *Documentation Form for a Dam Construction Permit* (DEP-IWRD-APP-103)
- ☐ Attachment F: *Documentation Form for Flood Management Certification* (DEP-IWRD-APP-104) (State Agencies Only)
- ☒ Attachment G: Plan Sheets and Drawings
- ☒ Attachment H: Engineering Documentation
 - Part 1: *Engineering Report Checklist* (DEP-IWRD-APP-105A) and an Engineering Report
 - Part 2: *Hydrologic and Hydraulic Consistency Worksheet* (DEP-IWRD-APP-105B)
 - Section I: Floodplain Management
 - Section II: Stormwater Management
 - For state agencies only:
 - Section III: State Grants and Loans
 - Section IV: Disposal of State Land
- ☒ Attachment I: Flood Contingency Plan
- ☒ Attachment J: Soil Scientist Report (not required for Flood Management Certification)
- ☒ Attachment K: Environmental Report (not required for Flood Management Certification)
- ☒ Attachment L: Mitigation Report - wetlands and watercourses, fish and wildlife (not required for Flood Management Certification)
- ☒ Attachment M: Alternatives Assessment (not required for Flood Management Certification)
- ☐ Attachment N: *Applicant Compliance Information Form* (DEP-APP-002) (not required for Flood Management Certification or 401 Water Quality Certification Approvals)
- ☐ Attachment O: *Applicant Background Information Form* (DEP-APP-008) (not required for Flood Management Certification)
- ☐ Attachment P: *Coastal Consistency Review Form* (DEP-APP-004) (if applicable)
- ☒ Attachment Q: Other Information: any other information the applicant deems relevant or is required by DEP.

Number of Copies of Application:

Submit one original of all application forms, certifications, reports and supporting documents and the number of photocopies of all such materials as noted on the *Permit Application Transmittal Form*. When applying for more than one permit, you should submit the original and no more than six copies.

Part VI: Application Certification

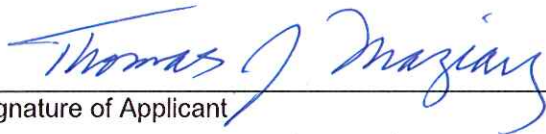
The applicant *and all* individuals responsible for actually preparing the application or supporting documentation must sign this part. An application will be considered insufficient unless **all** required signatures are provided. You must include signatures of any person preparing any report or parts thereof filed in support of this application (i.e., professional engineers, surveyors, soil scientists, biologists, environmental and other consultants, etc.).

"I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that based on reasonable investigation, including my inquiry of the individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief.

I understand that a false statement in the submitted information may be punishable as a criminal offense, in accordance with Section 22a-6 of the General Statutes, pursuant to Section 53a-157b of the General Statutes, and in accordance with any other applicable statute.

I certify that this application is on complete and accurate forms as prescribed by the commissioner without alteration of the text.

I certify that I will comply with all notice requirements as listed in Section 22a-6g of the General Statutes."



Signature of Applicant

12-03-2014

Date

Thomas J. Maziarz

Name of Applicant (print or type)

Bureau Chief, Policy & Planning

Title (if applicable)



Signature of Preparer (if different than above)

Date

DEC 2 2014

Matthew R. Vail

Name of Preparer (print or type)

Project Manager

Title (if applicable)

☐ Check here if additional signatures are required.

If so, please reproduce this sheet and attach signed copies to this sheet.

Reminder: After submitting this application to DEP, except in the case of a Flood Management Certification, you must publish a notice of the application immediately and submit a certified copy of this published notice to DEP. See "Notice of Permit Application" section in the instructions (DEP-IWRD-INST-100).

List the name of the newspaper the Notice of Permit Application will be published in:

Note: Please submit the *Permit Application Transmittal Form*, Application Form, Fee, and all Supporting Documents to:

CENTRAL PERMIT PROCESSING UNIT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

**ATTACHMENT A
EXECUTIVE SUMMARY
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

The project encompasses the I-84 eastbound Exit 63 off-ramp including improvements to the Route 30 and Route 83 approaches. There are three regulated sites affected by construction activities with a total regulated area impact of 0.156 acres (6,799 sq. ft.).

On the westbound approach of Route 30, the entire leg will be shifted slightly to the north to align with the new lane arrangement on the eastbound approach. This will require minor widening along the north side of Route 30.

The eastbound approach of Route 30, at the intersection with Route 83, will be widened. This will require modifications to Bridge No. 05238 over the Hockanum River. Field measurements were taken to confirm that by removing the sidewalk on the north side, an additional lane could be provided without widening the bridge.

SITE 1: I-84 EASTBOUND EXIT 63 OFF-RAMP BRIDGE (BRIDGE NO. 05234)

The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp. The new off-ramp alignment will require the replacement of the existing bridge (Site 1) and will require environmental permits for temporary impacts to the Inland Wetlands and FEMA Floodplain and Floodway.

DEEP Inland Fisheries only had concerns with Site 1. Although there will not be any permanent impacts to the Hockanum River, Brian Murphy did ask for the placement of a root-wad along the northern side of the river, approximately 100 feet downstream of the new abutment, to improve the characteristics of the existing river.

An infiltration trench is being installed from Sta. 213+00 to Sta. 214+25 Right to mitigate the increased runoff from the new off-ramp. The trench has been designed to reduce the post-construction runoff rate below the pre-construction runoff rate infiltrating 22% of the Water Quality Flow (0.514 cfs).

SITE 2: OUTLET PROTECTION STA. 219+75, 112' Right

The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time causing it to be delineated as an inland wetland. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel, reduce water velocity before flowing the remaining way to the Hockanum River (Site 2), and provide storage for 32% of the Water Quality Volume (7,275 ft³).

SITE 3: ROUTE 83 FILL EMBANKMENT

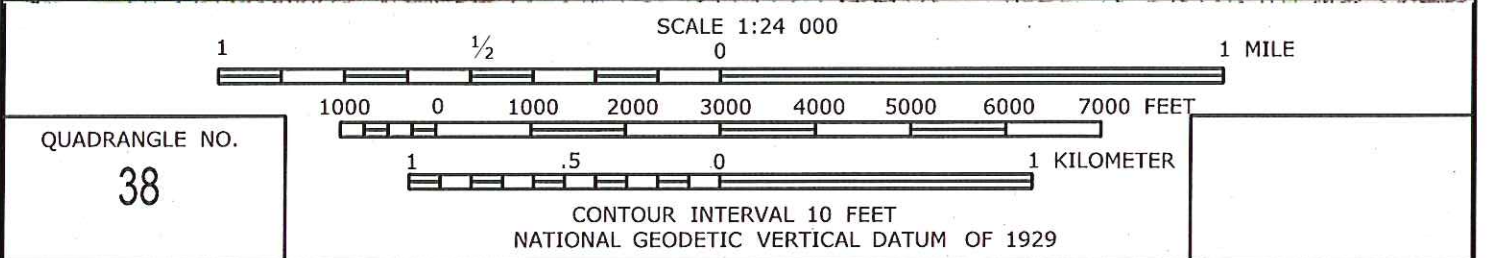
The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side, which would avoid any impacts to utility poles and provide proper alignment with the on-ramp. However, widening on the east side will permanently impact wetlands (Site 3) between Sta. 404+25 and Sta. 406+50 Right. A temporary wetland impact is also required for a temporary work area in order to install the drainage appurtenances at Sta. 405+25 Right.

**ATTACHMENT A
EXECUTIVE SUMMARY
PROJECT 76-193**

DEEP Wildlife conducted a review of State Listed Species and according to the Natural Diversity Data Base no species are anticipated within the project limits.

Several alternatives were considered during the preliminary design stage of the project to minimize the effects to adjacent inland wetlands.

Construction of this project is anticipated to begin in fall of 2015 and be completed in the fall of the 2016 construction season.



ATTACHMENT B

Attachment C: Documentation Form for the Following Permits:

- **Inland Wetlands and Watercourses Permit (CGS Section 22a-39)**
- **Stream Channel Encroachment Line Permit (CGS Section 22a-342 through 22a-349)**
- **401 Water Quality Certification Inland Waters (33 U.S.C. 1341)**

All applicants should review the application instructions (DEP-IWRD-INST-100). Applicants for an Inland Wetlands and Watercourses Permit should review CGS Sections 22a-36 through 22a-45 and RCSA Sections 22a-39-1 through 22a-39-15. Applicants for a Stream Channel Encroachment Line Permit should review CGS Section 22a-342. Applicants for 401 Water Quality Certification should review Section 401 of the Federal Water Pollution Control Act (33 U.S.C. 1341) and Connecticut's Water Quality Standards.

If more space is needed for your response, duplicate the form and attach additional pages to the form. If additional pages are attached, they should be numbered and titled to correspond to the specific number and title of the request for information on the application form.

1. Applicant Name: **Connecticut Department of Transportation**
(as indicated on the *Permit Application Transmittal Form*)
2. Check the permit(s) being requested in this application (check all that apply):
 - ☒ Inland Wetlands & Watercourses
 - ☐ Stream Channel Encroachment Lines
 - ☒ Water Quality Certification
3. If applying for a SCEL permit, indicate the SCEL Map number(s) wherein the proposed activity will take place, the property identifier and the date of the map referenced:
SCEL Map number(s) **N/A**
Property Identifier:
Date of the map referenced:
4. Name of wetland(s) and watercourse(s) involved:
Hockanum River
Unnamed wetlands tributary to the Hockanum River

Attachment C: Documentation Form (continued)

5. Describe the purpose and need for the proposed project.

The purpose of this project is to improve the operation and safety at the intersection of Routes 30 and 83 with I-84 eastbound Exit 63 on/off-ramps. The existing alignment of the off-ramp consists of three simple curves, each progressively sharper than the other. The current ratio between successive curves is not in compliance with Department guidelines. The lack of storage capacity has been known to cause queued vehicles to back up onto I-84. This complex curvature also creates a short stopping sight distance. This is evidenced by the large number of rear end accidents at this location including high speed accidents on the I-84 mainline. Due to the high incidence of accidents, there are three locations within the project limits that appear on the 2006-2008 SLOSSS. The intersection itself shows up twice on the list, once on Route 83 (# 305) and also on Route 30 (#1347). The Route 83 northbound approach to the intersection is also on the list (#502).

☐ Check here if additional sheets are necessary, and label and attach them to this sheet.

Attachment C: Documentation Form (continued)

6. *Description of the Regulated Activity:*

6a. Indicate the area, in acres and volume in cubic yards, of any fill, excavation, or other alterations of wetlands, watercourses and floodplains.

See attached acres

See attached cubic yards

6b. Describe all proposed regulated activities in and affecting wetlands, watercourses and floodplains. Include all discharges of dredged or fill material and storm waters incidental to the construction and/or operation of the proposed project.

See attached

☒ Check here if additional sheets are necessary, and label and attach them to this sheet.

**ATTACHMENT C
DESCRIPTION OF THE REGULATED ACTIVITY
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

6a. Indicate the area, in acres and volume in cubic yards, of any fill, excavation, or other alterations of wetlands, watercourses, and flood plains (continued):

Wetland Site Area, Cut, and Fill Information					
Wetland Site No.	Area of Wetland Impact (sf) [ac]	Fill (cy)	Excavation (cy)	Riprap (cy)	Granular Fill (cy)
1	4415 [.101] Temporary	-	-	-	-
2	185 [.004] Permanent	110	48	10.3	7
3	542 [.012] Temporary	-	-	-	-
3	1657 [.038] Permanent	115	-	-	-

6b. Describe all proposed regulated activities in and affecting wetlands, watercourses, and floodplains. Include all discharges of dredged or fill material and storm waters incidental to the construction and/or operation of the proposed project (continued):

The project encompasses the I-84 eastbound Exit 63 off-ramp including improvements to the Routes 30 and Route 83 approaches. The existing alignment of the off-ramp consists of three simple curves, each progressively sharper than the other. The current ratio between successive curves is not in compliance with Department guidelines. The lack of storage capacity of the existing off-ramp has been known to cause queued vehicles to back up onto I-84. This complex curvature also creates a very short stopping sight distance, which likely contributes to the large number of rear end accidents at this location.

SITE 1: I-84 EASTBOUND EXIT 63 OFF-RAMP BRIDGE (BRIDGE NO. 05234)

The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp from two to four lanes to provide a second left turn lane and an increased storage length for the existing exclusive right turn lane. The new off-ramp alignment will require the replacement of the existing bridge to provide four 11-foot travel lanes with a four-foot left shoulder and an eight-foot right shoulder, for improved storage capacity and improved sightlines to meet design standards. Special equipment such as large cranes will be required for the bridge construction.

ATTACHMENT C
DESCRIPTION OF THE REGULATED ACTIVITY
PROJECT 76-193

Only temporary impacts are required at Site 1 totaling 0.101 acres. The impacts are required to perform proper water handling in order to excavate for the new bridge abutments along both the north and south side of the Hockanum River. The water handling plans require sand bags to be installed confining all excavation, bridge construction, and roadway construction to be completed with one water handling stage as shown in the permit plans. All grading will be reestablished to match the existing conditions once the construction activities are over.

The suggested construction sequence begins by installing the sedimentation control system and the sand bag water handling system. Work can then proceed constructing the northern portion of the new bridge. Once completed, traffic is to be shifted onto the new portion of the bridge and demolition of the existing bridge can proceed. Once demolition is complete the southern portion of the bridge can be constructed. All work associated with the construction of the new bridge, including the construction of the northern portion of the bridge, the removal of the existing bridge, and the construction of the southern portion of the bridge shall be completed within the sand bag water handling system. Finally, after all bridge construction is completed the sand bag water handling system can be removed and all final grading around the abutments completed.

SITE 2: OUTLET PROTECTION STA. 219+75, 112' Right

Minor drainage modifications will be required to align the drainage structures at the new edge of pavement throughout the project. The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time, causing it to be delineated as an inland wetland. Trees and brush have grown throughout the riprap outlet channel and water discharging from the outlet has washed a well-defined channel through the sediment and down to the Hockanum River. Due to the reduction in paved surfaces throughout this drainage system, the 10 yr. flow discharging from the outlet has been reduced from 14.8 cfs down to 14.2 cfs. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel. The sediment trap will also reduce the discharge velocity of the water.

The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

Sedimentation and erosion controls will be installed prior to the start of work. Allowable time periods for unconfined and confined in-stream work provided by DEEP will determine when the Contractor will be allowed to work within wetland limits. Best Management Practices are required to set up and remove cofferdams and dewatering systems.

All disturbed areas will be reestablished per the planting plan. All activities will be performed in the dry and in accordance with Section 1.10, Environmental Compliance and Best Management Practices of the Department's Standard Specifications for Construction, Form 816.

SITE 3: ROUTE 83 FILL EMBANKMENT

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side to avoid any impacts to utility poles along the west side and provide proper alignment with the on-ramp. Widening on the east side will permanently

ATTACHMENT C
DESCRIPTION OF THE REGULATED ACTIVITY
PROJECT 76-193

impact wetlands (Site 3) between Sta. 404+25 and Sta. 406+50 Right and will require a slope easement for support of the highway from the adjacent property. A temporary work area is also required in order to install the drainage appurtenances at Sta. 405+25 Right. Although the plans do not indicate any proposed activities within the Temporary Work Area, it will be provided to allow room for water handling and access to the inlet of the 15 inch pipe if required.

Approximately 115 c.y. of fill will be placed in the wetland along the eastern side of Route 83 from Sta. 404+25 and Sta. 406+50 Right to provide for the widening and support of the roadway. The total amount of permanent and temporary wetland impact is 0.050 acres. This includes 0.038 acres of permanent wetland impact for the placement of the fill described above and 0.012 acres of temporary wetland impact for the temporary work area.

Attachment C: Documentation Form (continued)

7. *Description of Site* - Describe all natural and man-made features at the property at which the regulated activity is proposed to be conducted.

See attached

☒ Check here if additional sheets are necessary, and label and attach them to this sheet.

8. *Disposal of Excess Material* - State the type and quantity of excess material anticipated from the project and where such material will be disposed.

In the event that there is excess material, the disposal of it will be done in accordance with the Department's "Best Management Practices" and in conjunction with Section 2.02 of the Department's Standard Specifications for Roads, Bridges, and Incidental Construction.

☐ Check here if a disposal plan is included as Attachment C8.

**ATTACHMENT C
DOCUMENTATION FORM
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

7. Description of Site:

Site 1:

A new bridge will be constructed to convey the new off-ramp over the Hockanum River at Site 1. The new bridge abutments will be located directly upstream of the smaller existing abutments. Minor vegetation growing along the immediate edge of the river, through the shallow rocky embankment, separates a walking trail along both sides of the river. In the immediate area of the existing abutments, modified riprap stabilizes the embankment around both abutments and slopes down to the foot of the walking paths continuing to the river's edge. Further from the existing abutments, the embankment slopes up at approximately 2:1(H:V) starting behind the walking trails continuing up to the grade of the roadway. These embankments are lightly wooded and contain dense brush. Just north of the proposed abutment on the north side of the river is an existing sediment trap that was created during the original construction of I-84.

Site 2:

Stormwater Quality improvements are proposed at the existing drainage outlet located at Sta. 219+75, 112' Right. The existing modified riprap scour hole has filled in with sediment over time. Currently, the water discharges from the outlet and has washed a small, well defined channel through the deposited sediment and continues down the remaining riprap channel to the Hockanum River. Trees and brush have grown in the sediment deposited in the existing scour hole making it ineffective. Also flowing into the existing scour hole from the south is a riprap channel conveying flow from a single catch basin on Route 30. This channel also contains sediment which impedes the flow of the water, but is not delineated as a wetland. The channel will be cleaned during construction to restore it to its original working condition.

Site 3:

Widening of Route 83 will require the placement of fill within the wetland at Site 3. This wetland is a low swampy area covered with large trees and brush. The water from this area flows into the state stormwater system on Route 83, eventually discharging from the system into the Hockanum River. Separating the wetland from the state's drainage system is an embankment with a concrete weir. A 15 inch HDPE pipe carries water through the embankment and weir conveying low flows to the state's 24 inch inlet pipe. The existing weir structure has been designed for an adjacent development to use the low-lying wetland to detain flow from their site. Larger flows fill the wetland area until eventually they flow over the weir and into the state system.

Attachment C: Documentation Form (continued)

9. *Inland Wetlands and Watercourses Applications Only:*

- a. Is the project located in a public water supply watershed? ☐ Yes ☒ No

If Yes, the applicant must give written notice to the water company of the filing of this application in accordance with CGS Section 22a-42f.

If Yes, include a copy of that notice as Attachment C9a.

- b. Is any portion of an inland wetland or watercourse in which the regulated activity is proposed located within 500 feet of another municipality? ☐ Yes ☒ No

If Yes, the applicant must give written notice to the inland wetlands agency of such municipality of the filing of this application in accordance with CGS Section 22a-42c.

If Yes, include a copy of that notice as Attachment C9b.

- c. Is the owner of the subject property different than the applicant? ☐ Yes ☒ No

If Yes, the owner must give written consent to the proposed activity in accordance with RCSA Section 22a-39-5.2.

If Yes, include a copy of that consent as Attachment C9c.

10. *Inland Wetlands and Watercourses Applications Only:*

List the names and addresses of the current owners of record of land abutting the site of the proposed regulated activity.

Name: **Lynch Family LLC**

Address: **179 Tolland Turnpike**

City/Town: **Manchester**

State: **CT**

Zip Code: **06042**

Mailing address, if different than above:

Mailing Address:

City/Town:

State:

Zip Code:

Name: **Devcon Manchester LLC**

Address: **234 Tolland Turnpike**

City/Town: **Manchester**

State: **CT**

Zip Code: **06042**

Mailing address, if different than above:

Mailing Address:

City/Town:

State:

Zip Code:

Name: **Two Sixty Tolland Turnpike LLC**

Address: **260 Tolland Turnpike**

City/Town: **Manchester**

State: **CT**

Zip Code: **06042**

Mailing address, if different than above:

Mailing Address:

City/Town:

State:

Zip Code:

☒ Check here if additional sheets are necessary, and label and attach them to this sheet.

**ATTACHMENT C
DOCUMENTATION FORM
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation

PROJECT NUMBER: 76-193

TOWN: Manchester, Connecticut

10. List the names and addresses of the current owners of record of land abutting the site of the proposed regulated activity – Additional Owners:

Owner	Street	Town	State	Zip Code
D F C of Manchester LLC	480 Oakland Street	Manchester	CT	06042
Four Hundred Forty (440)	440 Oakland Street	Manchester	CT	06042
Three Sisters Realty LLC	460 Oakland Street	Manchester	CT	06042
ESH/HV Properties LLC	340 Tolland Turnpike	Manchester	CT	06042
Alliance Energy LLC	330 Tolland Turnpike	Manchester	CT	06042

Attachment C: Documentation Form (continued)

11. Section 401 Water Quality Certification Applications Only:

In order to obtain a Section 401 Water Quality Certification from the DEP, you must have applied for a federal license or permit for an activity which may result in a discharge into the waters of the United States, including wetlands.

- a. Has an application for a federal license or permit been submitted to the Army Corps of Engineers or other federal agency? ☒ Yes ☐ No

If Yes, include a complete copy of the application form and plans as Attachment C11a.

- b. If the Section 401 Water Quality Certification application is for an activity authorized by an individual or programmatic general permit issued by the Army Corps of Engineers under section 404 of the federal Clean Water Act, identify such permit by name and application or file number.

Permit Name: **ACOE Category II**

Application or File Number: **Pending**

12. Summary of Documents submitted with Attachment C: Check each document being submitted under Attachment C as verification that all applicable documents have been submitted.

- ☐ Attachment C8: Disposal Plan
- ☐ Attachment C9a: If the project is located in a public water supply watershed, provide a copy of the written notice sent to the water company of the filing of this application in accordance with CGS Section 22a-42f.
- ☐ Attachment C9b: If any portion of an inland wetland or watercourse in which the regulated activity is proposed to be located is within 500 feet of another municipality, provide a copy of the written notice sent to the inland wetlands agency of such municipality of the filing of this application in accordance with CGS Section 22a-42c.
- ☐ Attachment C9c: If the owner of the subject property is different than the applicant, provide a copy of the owner's written consent to the proposed activity in accordance with RCSA Section 22a-39-5.2.
- ☒ Attachment C11a: *Section 401 Water Quality Certification Applications Only*: a complete copy of the application form and plans submitted to a federal agency for a federal license or permit.
- ☐ Other, please specify:

**ATTACHMENT C
DOCUMENTATION FORM
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

11a. Army Corps of Engineers Permit Application -

Please see the following pages for a copy of the signed Application:

Date: 12/3/14

Ms. Susan Lee
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742-2751

Subject: State Project No. 76-193
Improvements on I-84 Exit 63 Off-Ramp and Intersection of Routes 30 & 83
Town of Manchester

Dear Ms. Lee:

Enclosed please find the Section 404 permit application for your review and approval. Applications for Inland Wetlands and Watercourses and 401 Water Quality Certification was previously submitted to the Connecticut Department of Energy and Environmental Protection under a separate cover letter for processing.

Any questions pertaining to this application may be directed to Mr. Andrew H. Davis, Transportation Supervising Planner, at (860) 594-2157.

Very truly yours,



Mark W. Alexander
Transportation Assistant Planning Director
Bureau of Policy and Planning

Attachments

cc: Nathan Margason - USEPA
Marie Tur - USFWS
Robert Gilmore - CT DEEP

Camil Zuk

bcc: Robbin L. Cabelus – Mark W. Alexander
Andrew H. Davis – Kevin Carifa – Chris. W. Samorajczyk
Timothy M. Wilson – William W. Britnell – Matthew R. Vail
Ravi V. Chandran – Dean P. Cerasoli
Michael E. Masayda

X:\076_0193_2007\Highways_All_Other_Data\Permits\ACOE\0_Application Cover Letter.doc

U.S. ARMY CORPS OF ENGINEERS
APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT
33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved -
OMB No. 0710-0003
Expires: 31-AUGUST-2013

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE
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(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME First - Thomas Middle - J Last - Maziarz Company - Connecticut DOT - Bureau Chief, Policy & Planning E-mail Address - Thomas.Maziarz@ct.gov		8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required) First - N/A Middle - Last - Company - E-mail Address -	
6. APPLICANT'S ADDRESS: Address- 2800 Berlin Turnpike City - Newington State - CT Zip - 06111 Country - USA		9. AGENT'S ADDRESS: Address- N/A City - State - Zip - Country -	
7. APPLICANT'S PHONE NOS. w/AREA CODE a. Residence b. Business c. Fax N/A (860) 594-2931 (860) 594-3028		10. AGENTS PHONE NOS. w/AREA CODE a. Residence b. Business c. Fax N/A	

STATEMENT OF AUTHORIZATION

11. I hereby authorize, N/A to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

SIGNATURE OF APPLICANT

DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions) STATE PROJECT 76-193, Improvements on I-84 EB Exit 63 On/Off Ramps and Intersection of Routes 30 & 83			
13. NAME OF WATERBODY, IF KNOWN (if applicable) Hockanum River & Unnamed Tributary to Hockanum River		14. PROJECT STREET ADDRESS (if applicable) Address N/A	
15. LOCATION OF PROJECT Latitude: °N 41.811 Longitude: °W 72.518		City - State - Zip -	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) State Tax Parcel ID Municipality Manchester, Connecticut Section - Township - Range -			

17. DIRECTIONS TO THE SITE

The project is located at the intersection of the I-84 Eastbound Exit 63 on/off-ramps with Routes 30 and 83 in the town of Manchester, CT.

18. Nature of Activity (Description of project, include all features)

Please see attachment.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose of this project is to improve the operation and safety at the intersection of Routes 30 and 83 with I-84 Exit 63 eastbound on/off-ramps. The existing alignment of the off-ramp consists of three simple curves, each progressively sharper than the other. The current ratio between successive curves is not in compliance with Departmental guidelines. The lack of storage capacity has been known to cause queued vehicles to back up onto I-84. This complex curvature also creates a short stopping sight distance. This is evidenced by the large number of rear end accidents at this location including high speed accidents on the I-84 mainline. Due to the high incidence of accidents, there are three locations within the project limits that appear on the 2006-2008 SLOSS. The intersection itself shows up twice on the list, once on Route 83 (# 305) and also on Route 30 (#1347). The Route 83 northbound approach to the intersection is also on the list (#502). Construction of this project is anticipated to begin in spring of 2015 and be completed in the fall of the 2016 construction season.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side, which would avoid any impacts to utility poles and provide proper alignment with the on-ramp. However, widening on the east side will permanently impact wetlands (Site 3) between Sta. 404+25 and Sta. 406+50 Right and will require a sliver acquisition of additional right-of-way. Approximately 115 c.y. of fill will be placed in the wetland along the eastern side of Route 83 from Sta. 404+25 and Sta. 406+50 Right to provide for the widening and support of the roadway.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
Site 3 - Fill Material - 115 Cubic Yards		

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres The Fill within Site 3 will encompass .050 Acres and will be placed with a backhoe or dozer from outside the wetland limit.
or
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Please see attachment.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- Lynch Family LLC - 179 Tolland Turnpike

City - Manchester State - CT Zip - 06042

b. Address- Devcon Manchester LLC - 234 Tolland Turnpike

City - Manchester State - CT Zip - 06042

c. Address- Two Sixty Tolland Turnpike LLC - 260 Tolland Turnpike

City - Manchester State - CT Zip - 06042

d. Address- D F C of Manchester LLC - 480 Oakland Street

City - Manchester State - CT Zip - 06042

e. Address- Four Hundred Forty(440) - 440 Oakland Street

City - Manchester State - CT Zip - 06042

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
CTDEEP	Inland Wetland Indiv.	TBD	TBD	TBD	
CTDEEP	401 Water Quality	TBD	TBD	TBD	
CTDOT	Flood Mgmt Gen Cert	N/A	6/11/2014	6/16/2014	

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.


SIGNATURE OF APPLICANT DATE

SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

**A.C.O.E. Cat II-Programmatic
Supplemental Information
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

Item 18: Nature of Activity

The project encompasses the I-84 eastbound Exit 63 off-ramp including improvements to the Routes 30 and Route 83 approaches. The existing alignment of the off-ramp consists of three simple curves, each progressively sharper than the other. The current ratio between successive curves is not in compliance with Department guidelines. The lack of storage capacity of the existing off-ramp has been known to cause queued vehicles to back up onto I-84. This complex curvature also creates a very short stopping sight distance, which likely contributes to the large number of rear end accidents at this location.

SITE 1: I-84 EASTBOUND EXIT 63 OFF-RAMP BRIDGE (BRIDGE NO. 05234)

The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp from two to four lanes to provide a second left turn lane and an increased storage length for the existing exclusive right turn lane. The new off-ramp alignment will require the replacement of the existing bridge to provide four 11-foot travel lanes with a four-foot left shoulder and an eight-foot right shoulder, for improved storage capacity and improved sightlines to meet design standards. Special equipment such as large cranes will be required for the bridge construction.

Only temporary impacts are required at Site 1 totaling 0.101 acres. The impacts are required to perform proper water handling in order to excavate for the new bridge abutments along both the north and south side of the Hockanum River. The water handling plans require coffer dams to be installed confining all excavation, bridge construction, and roadway construction to be completed with one water handling stage as shown in the permit plans. All grading will be reestablished to match the existing conditions once the construction activities are over. There will be no permanent placement of dredged or fill material within the wetlands.

SITE 2: OUTLET PROTECTION STA. 219+75, 112' Right

Minor drainage modifications will be required to align the drainage structures at the new edge of pavement throughout the project. The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time, causing it to be delineated as an inland wetland. Trees and brush have grown throughout the riprap outlet channel and water discharging from the outlet has washed a well-defined channel through the sediment and down to the Hockanum River. Due to the reduction in paved surfaces throughout this drainage system, the 10 yr. flow discharging from the outlet has been reduced from 14.8 cfs down to 14.2 cfs. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel. The sediment trap will also reduce the discharge velocity of the water.

**A.C.O.E. Cat II-Programmatic
Supplemental Information
PROJECT 76-193**

The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

Sedimentation and erosion controls will be installed prior to the start of work. Allowable time periods for unconfined and confined in-stream work provided by DEEP will determine when the Contractor will be allowed to work within wetland limits. Best Management Practices are required to set up and remove cofferdams and dewatering systems.

All disturbed areas will be reestablished per the planting plan. All activities will be performed in the dry and in accordance with Section 1.10, Environmental Compliance and Best Management Practices of the Department's Standard Specifications for Construction, Form 816.

SITE 3: ROUTE 83 FILL EMBANKMENT

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side to avoid any impacts to utility poles along the west side and provide proper alignment with the on-ramp. Widening on the east side will permanently impact wetlands (Site 3) between Sta. 404+25 and Sta. 406+50 Right and will require a slope easement for support of the highway from the adjacent property. A temporary work area is also required in order to install the drainage appurtenances at Sta. 405+25 Right. Although the plans do not indicate any proposed activities within the Temporary Work Area, it will be provided to allow room for water handling and access to the inlet of the 15 inch pipe if required.

Approximately 115 c.y. of fill will be placed in the wetland along the eastern side of Route 83 from Sta. 404+25 and Sta. 406+50 Right to provide for the widening and support of the roadway. The total amount of permanent and temporary wetland impact is 0.050 acres. This includes 0.038 acres of permanent wetland impact for the placement of the fill described above and 0.012 acres of temporary wetland impact for the temporary work area.

**A.C.O.E. Cat II-Programmatic
Supplemental Information
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

Item 23: Description of Avoidance, Minimization, and Compensation

Impacts to the wetlands could not be avoided due to the improvements required to improve the safety and operation of the intersection. The impacts have been minimized by designing the new bridge structure for the off/ramp outside wetland limits causing only the need for temporary impacts during construction. Due to the large infield areas between the ramp and I-84, most of the work can be performed upland of the wetland limit eliminating the need to have large equipment within the existing wetland for prolonged timeframes. Also, lane widths have been minimized on Route 83 to decrease the amount of wetland impact and fill required for the roadway widening.

While project 76-193 has minimal permanent impacts, several precautions are proposed to protect wildlife habitat and water quality. DEEP Wildlife conducted a review of State Listed Species and according to the Natural Diversity Data Base; there are no species of special concern within the project limits.

DEEP Fisheries only had concerns with Site 1. Although there will not be any permanent impacts to the Hockanum River, Brian Murphy did ask for the placement of a rootwad along the northern side of the river, approximately 100 feet downstream of the new abutment, to improve the characteristics of the existing river

Several additional improvements are proposed to enhance both wildlife habitat and water quality. An infiltration trench will be installed at Site 1, which will reduce direct surface water runoff to the stream. The existing riprap channel at Site 2 is currently overgrown with brush and full of sediment. The trap will be excavated to provide a sediment trap, which will remove sediment more effectively than the existing channel and also reduce the discharge velocity of the water.

To further enhance water quality and habitat value, a native planting plan is provided for all three impact areas.

**A.C.O.E. Cat II-Programmatic
Supplemental Information
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

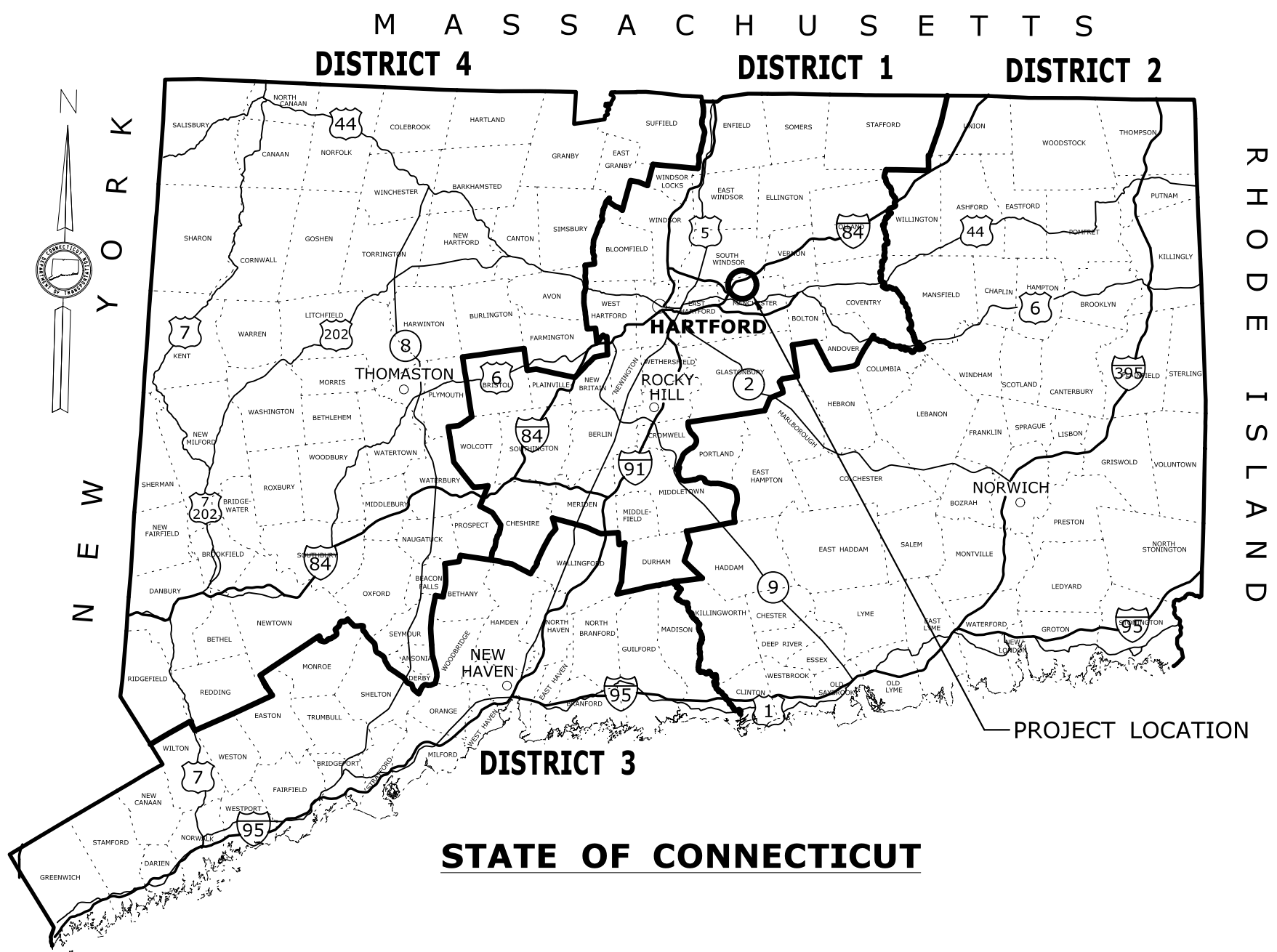
Item 25: Addresses of Adjoining Property Owners:

Owner	Street	Town	State	Zip Code
Three Sisters Realty LLC	460 Oakland Street	Manchester	CT	06042
ESH/HV Properties LLC	340 Tolland Turnpike	Manchester	CT	06042
Alliance Energy LLC	330 Tolland Turnpike	Manchester	CT	06042

The Army Corps of Engineers

Attachment A

Plan Sheets



ENVIRONMENTAL PERMIT PLANS

IMPROVEMENTS ON I-84 EXIT 63 EB OFF-RAMP AND INTERSECTION OF ROUTE 30 & ROUTE 83

TOWN OF MANCHESTER

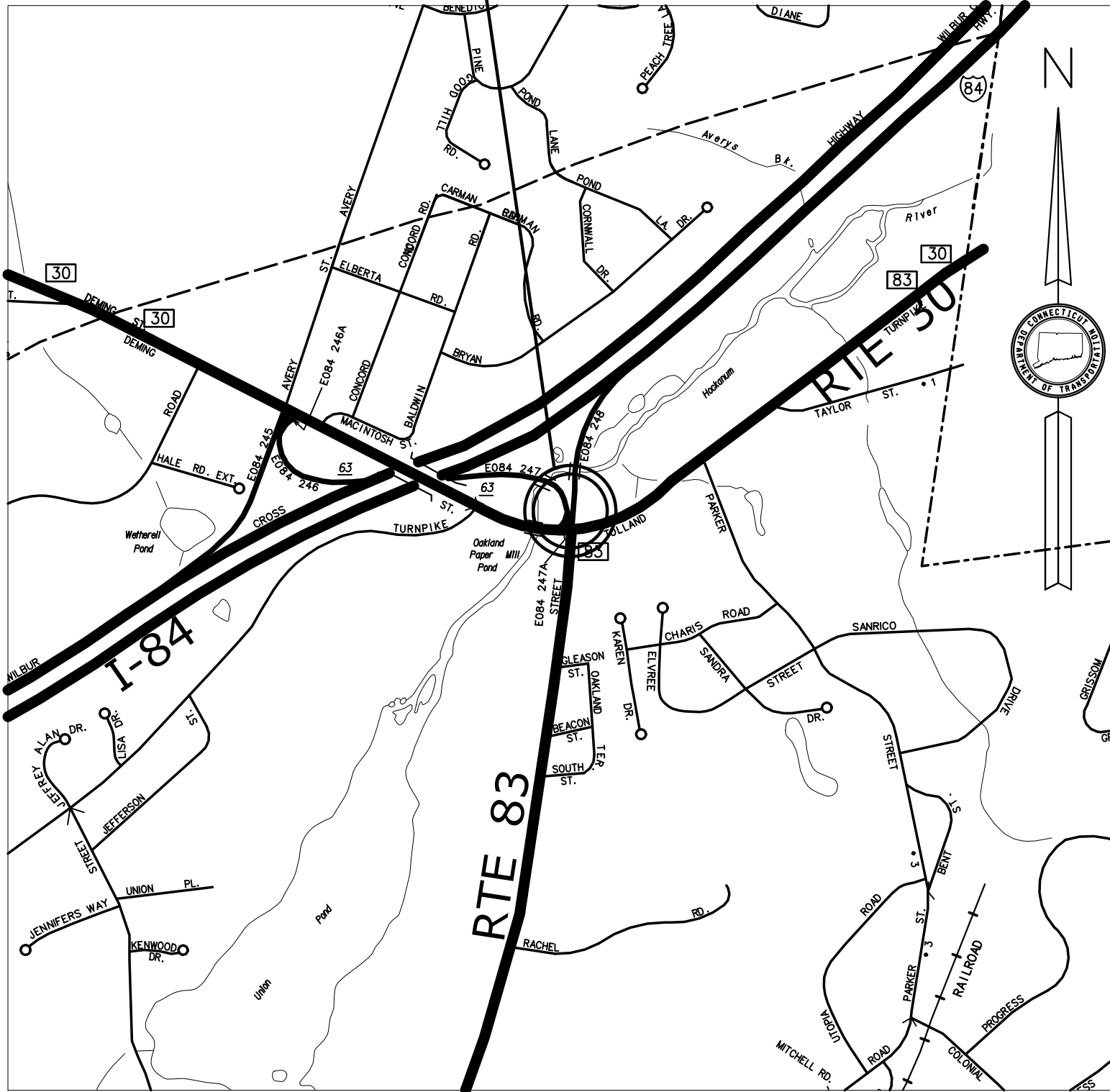
STATE PROJECT NO. 0076-0193

GENERAL NOTES:

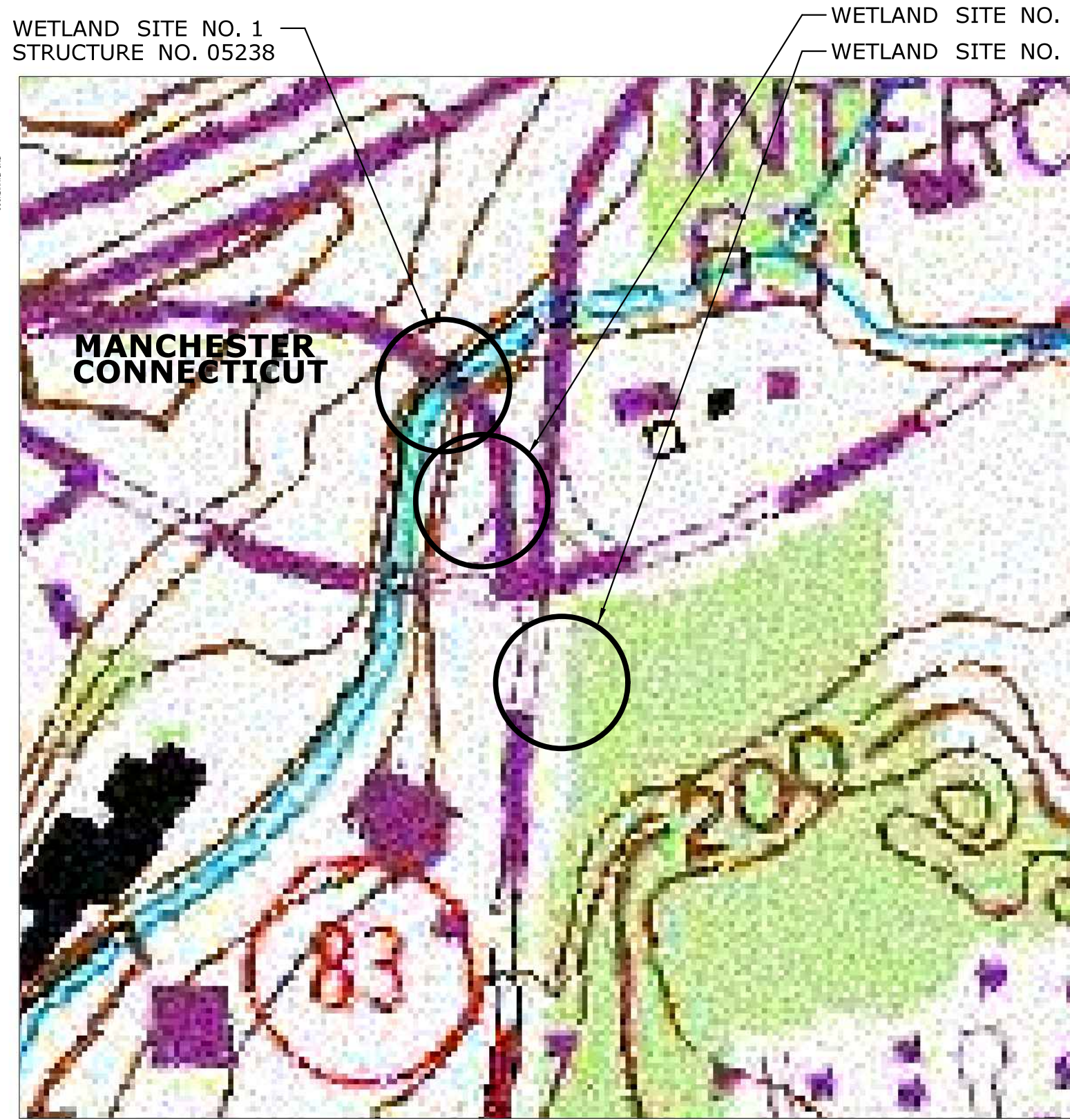
- THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
- ALL PERTINENT INFORMATION SUBJECT TO THE IMPACT OF THE WETLANDS IS SHOWN AND CALLED OUT IN THE ENCLOSED CIRCLES. TECHNICAL REVISIONS WILL BE SUBMITTED TO DEEP WHEN THE DOT MAKES DESIGN CHANGES FOR THOSE ITEMS CALLED OUT IN THE ENCLOSED CIRCLES, OR FOR ANY ROADWAY CONSTRUCTION THAT IMPACTS THE REGULATED AREAS.
- THE CONTRACTOR SHALL PREPARE EROSION AND SEDIMENTATION CONTROL PLANS BASED ON THE CONTRACT DRAWINGS AND THE STORMWATER POLLUTION CONTROL PLAN, IN ACCORDANCE WITH SECTION 1.10 ENVIRONMENTAL COMPLIANCE, INCLUDING BEST MANAGEMENT PRACTICES. AS SPECIFIED, THE PLANS SHALL BE CONSISTENT IN ALL RESPECTS WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENTATION CONTROL, AND WITH CONNDOT'S ON-SITE MITIGATION FOR CONSTRUCTION ACTIVITIES. THE PLANS SHALL INCLUDE DETAILS OF THE PROPOSED SYSTEMS.
- IN ALL CASES, THE CONTRACTOR SHALL IMPLEMENT STABILIZATION MEASURES AS SOON AS POSSIBLE AFTER ANY SOIL DISTURBANCE. WHERE CONSTRUCTION ACTIVITIES HAVE BEEN PERMANENTLY CEASED OR HAVE TEMPORARILY BEEN SUSPENDED FOR MORE THAN SEVEN DAYS, OR WHEN FINAL GRADES ARE REACHED IN ANY PORTION OF THE SITE, STABILIZATION PRACTICES SHALL BE IMPLEMENTED WITHIN THREE DAYS. AREAS THAT WILL REMAIN DISTURBED BUT INACTIVE FOR 30 DAYS OR MORE SHALL BE STABILIZED WITHIN THE FIRST SEVEN DAYS OF THAT PERIOD, THE CONTRACTOR SHALL COMPLY AT ALL TIMES WITH THE REQUIREMENTS OF SECTION 1.10.
- SEE THE PERMIT APPLICATION FOR A DESCRIPTION OF THE WATERCOURSES, WETLAND AND WETLAND SOILS, AND ADDITIONAL NARRATIVE INFORMATION.
- NOTE THAT ALL ELEVATIONS ON THIS PROJECT ARE BASED ON AN NGVD OF 1929.

LOCATION KEY - USGS QUADRANGLE TOPOGRAPHIC MAPS		
MAP #	USGS QUADRANGLE	GENERAL INFORMATION
38	MANCHESTER	7.5 MINUTES SERIES

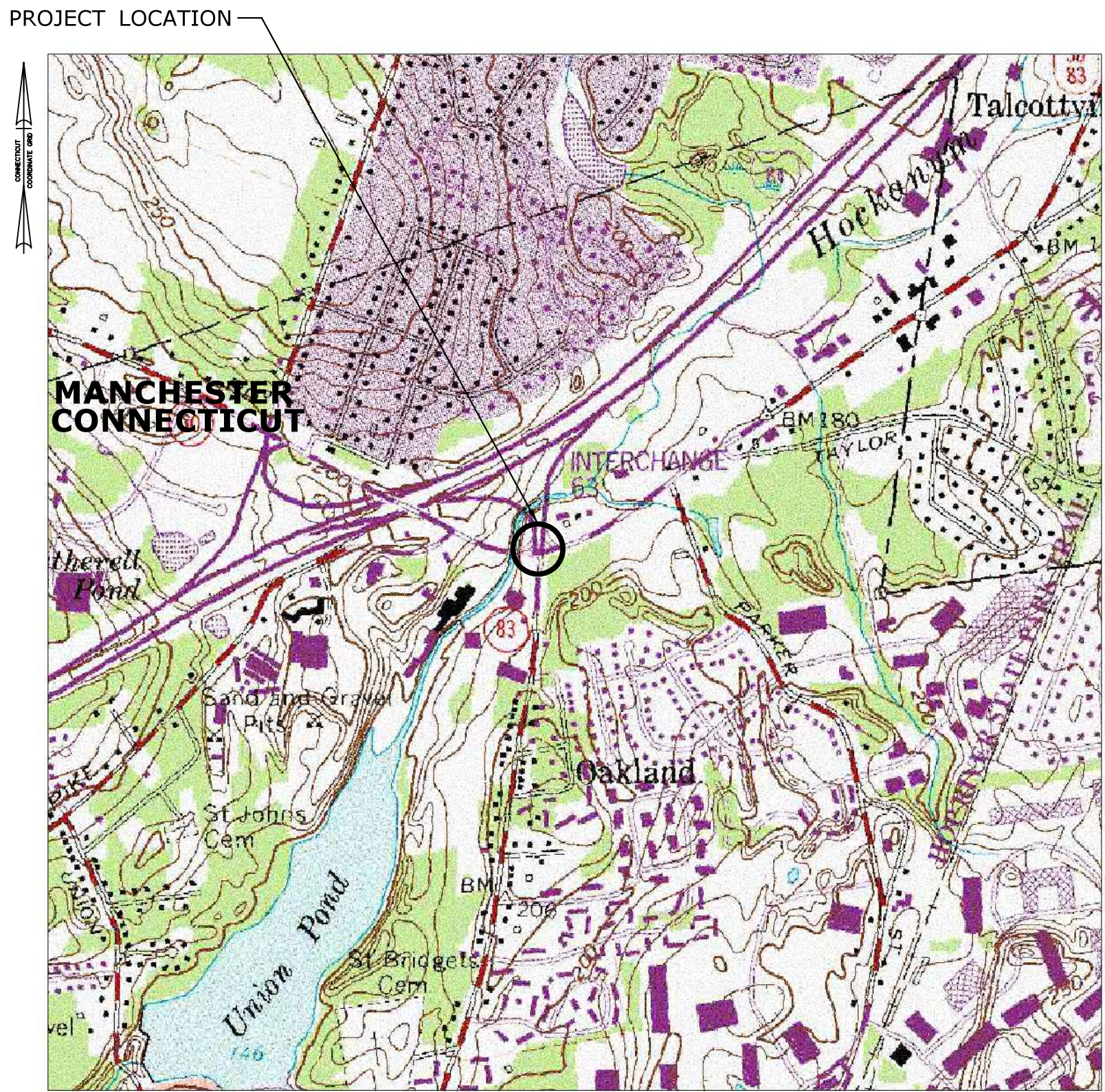
PROJECT LOCATION



LOCATION MAP MANCHESTER
SCALE: 1" = 1000'



LOCATION OF WETLANDS
SCALE: 1" = 200'



LOCATION OF PROJECT
SCALE: 1" = 1000'

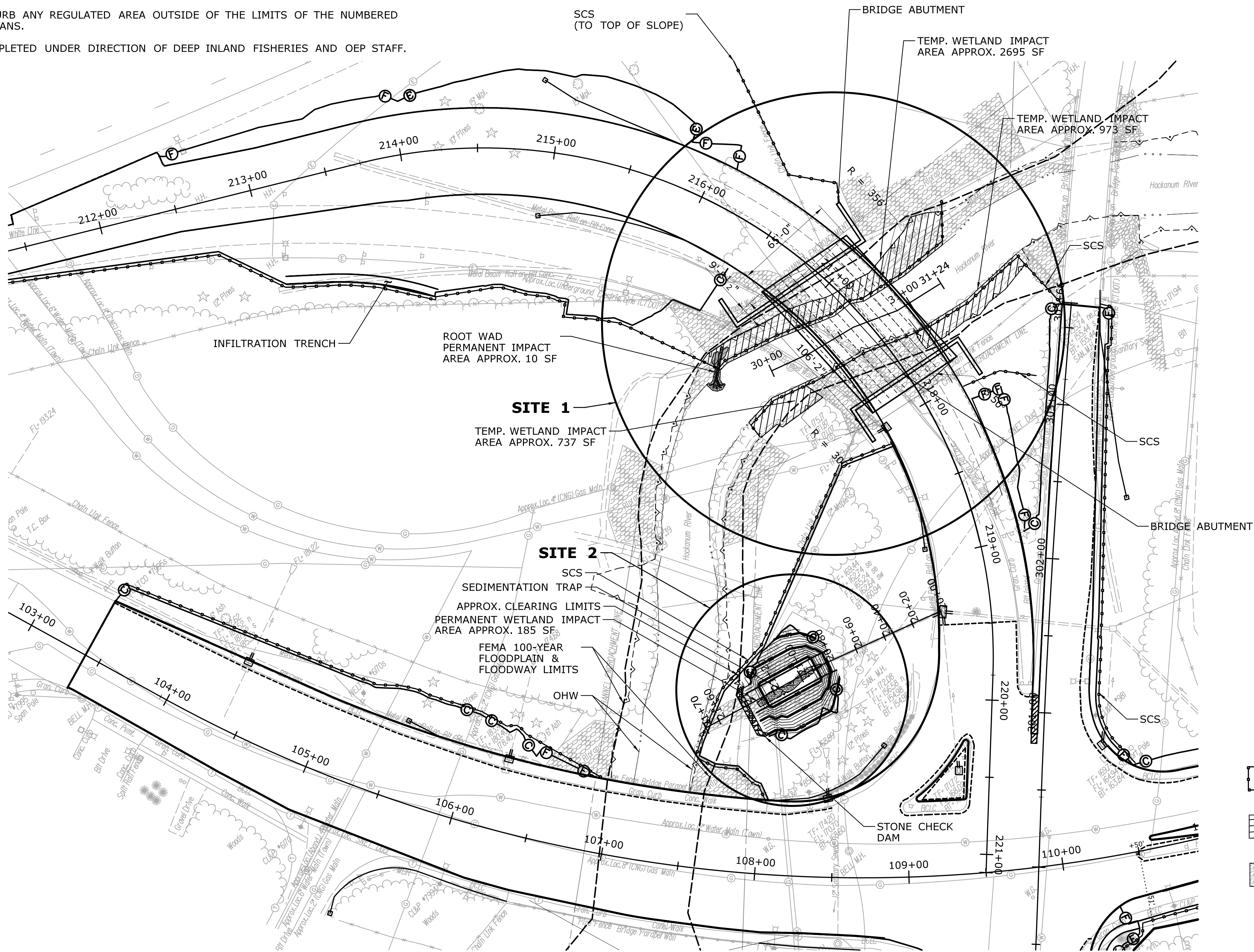
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

- - - - - - - - - - - - - - - - - -			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.		DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE AS NOTED	 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: ...\\HW_PER_0076_0193_PLN_TITLE.dgn.dgn	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: MATTHEW R. VAIL DATE: 12/1/2014	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: MANCHESTER DRAWING TITLE: TITLE SHEET ENV. PERMIT PLANS	PROJECT NO. 076-193 DRAWING NO. PER-01 SHEET NO.
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014						

GENERAL NOTES

1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
3. ROOT WAD PLACEMENT TO BE COMPLETED UNDER DIRECTION OF DEEP INLAND FISHERIES AND OEP STAFF.

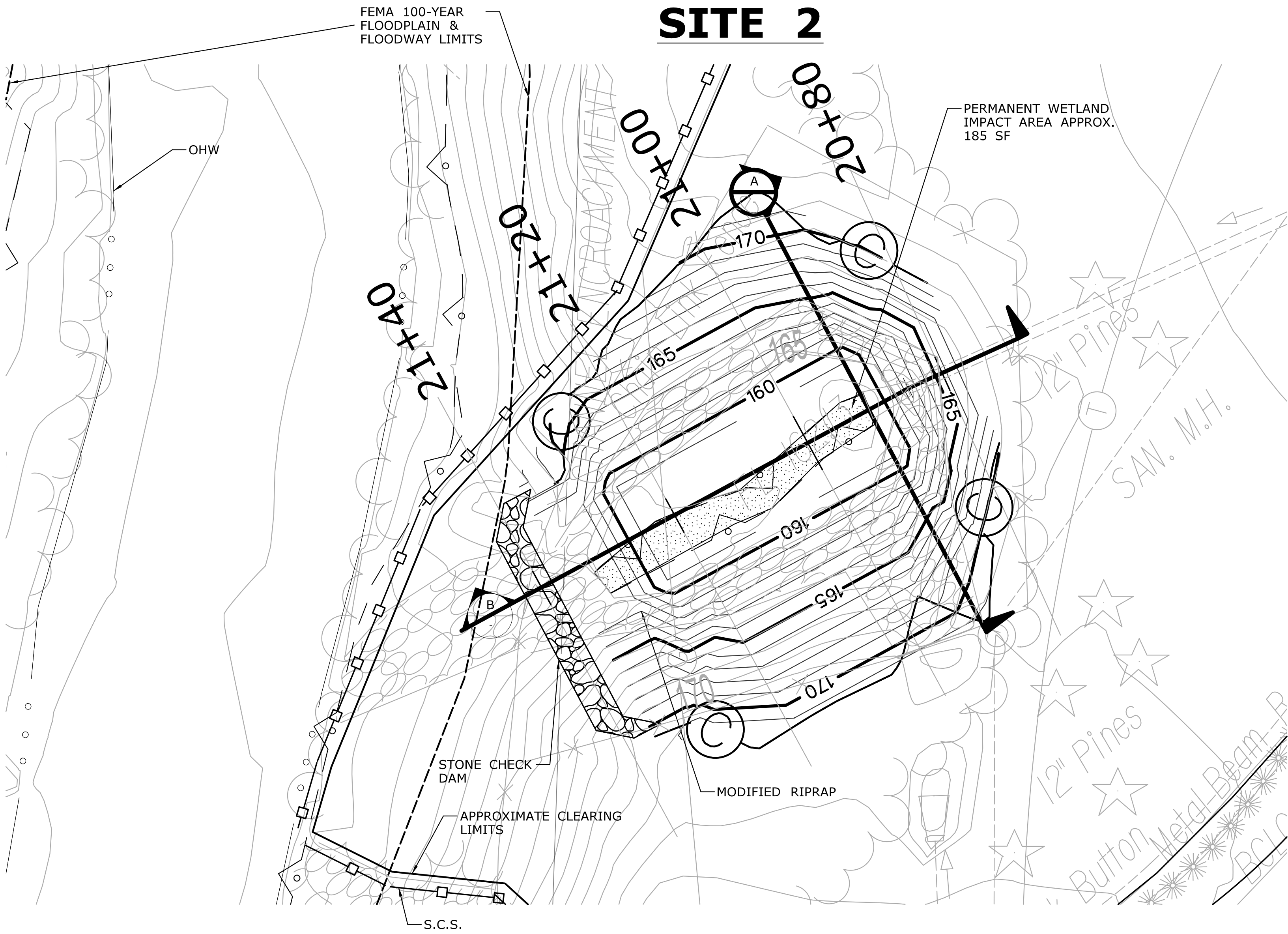
WETLAND SITE AREA, CUT, & FILL INFORMATION					
WETLAND SITE NO.	AREA OF WETLAND IMPACT (SF) [AC.]	FILL (CY)	EXCAVATION (CY)	RIPRAP (CY)	GRANULAR FILL (CY)
1	4415 [.101] TEMP.	-	-	-	-
2	185 [.004] PERM.	110	48	10.3	7



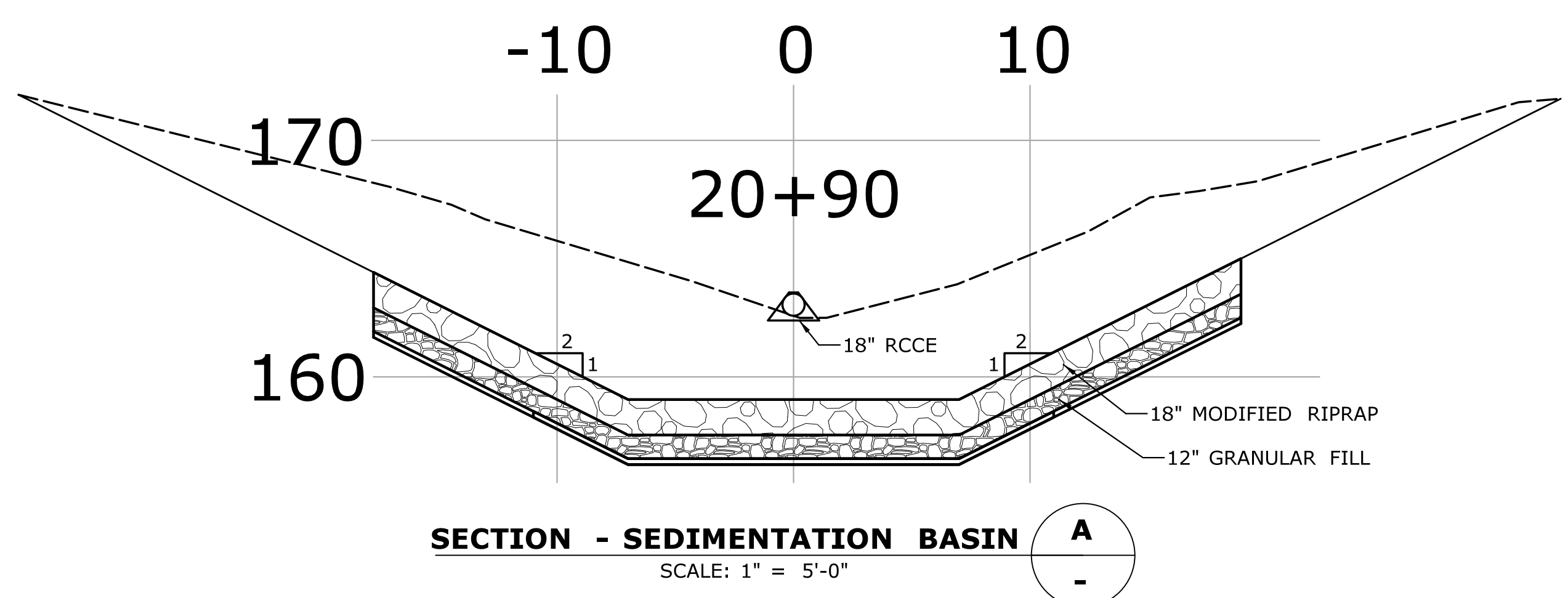
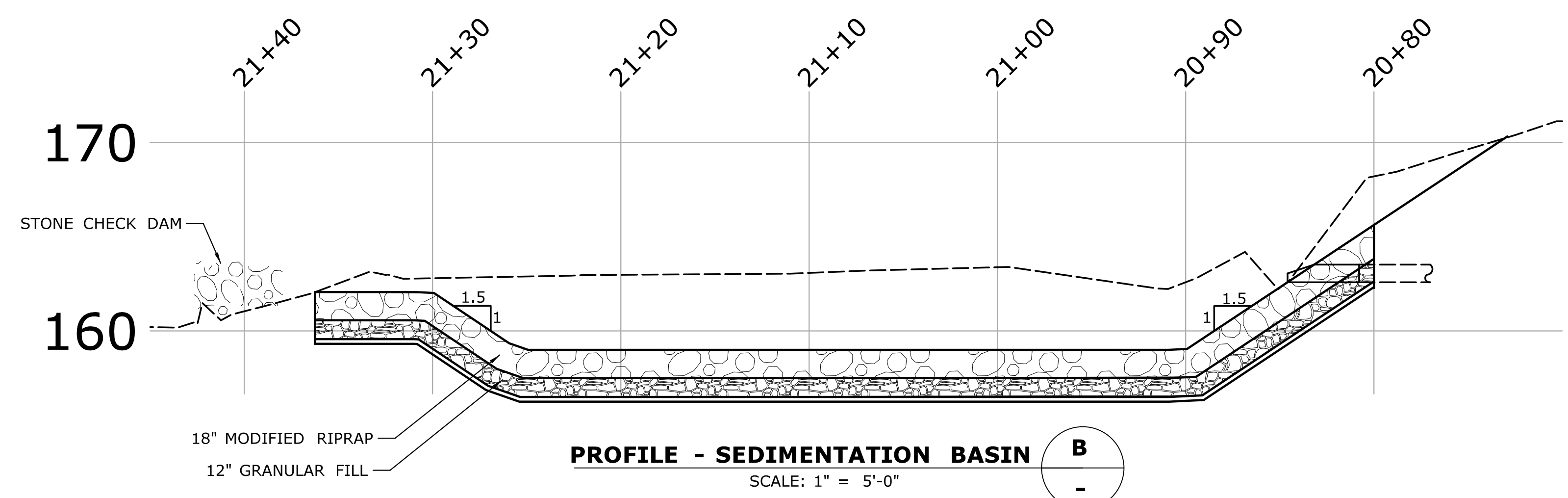
SITE 1 & 2 ENVIRONMENTAL PLAN

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014	DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE AS NOTED	 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: ...VHW_PER_0076_0193_PER_02.dgn	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: MATTHEW R. VAIL 12/1/2014	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER DRAWING TITLE: SITE 1 & 2 ENV. PERMIT PLANS	PROJECT NO. 76-193 DRAWING NO. PER-02 SHEET NO.
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- GENERAL NOTES
1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
 2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
 3. EXCAVATION OF SEDIMENTATION BASIN TO BE COMPLETED DURING DRY CONDITIONS.



DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	

DESIGNER/DRAFTER:	CHECKED BY:	SCALE AS NOTED
CZ	MV	

STATE OF CONNECTICUT	DEPARTMENT OF TRANSPORTATION
Filename: ...\\HW...PER_0076_0193_PER_03.dgn	

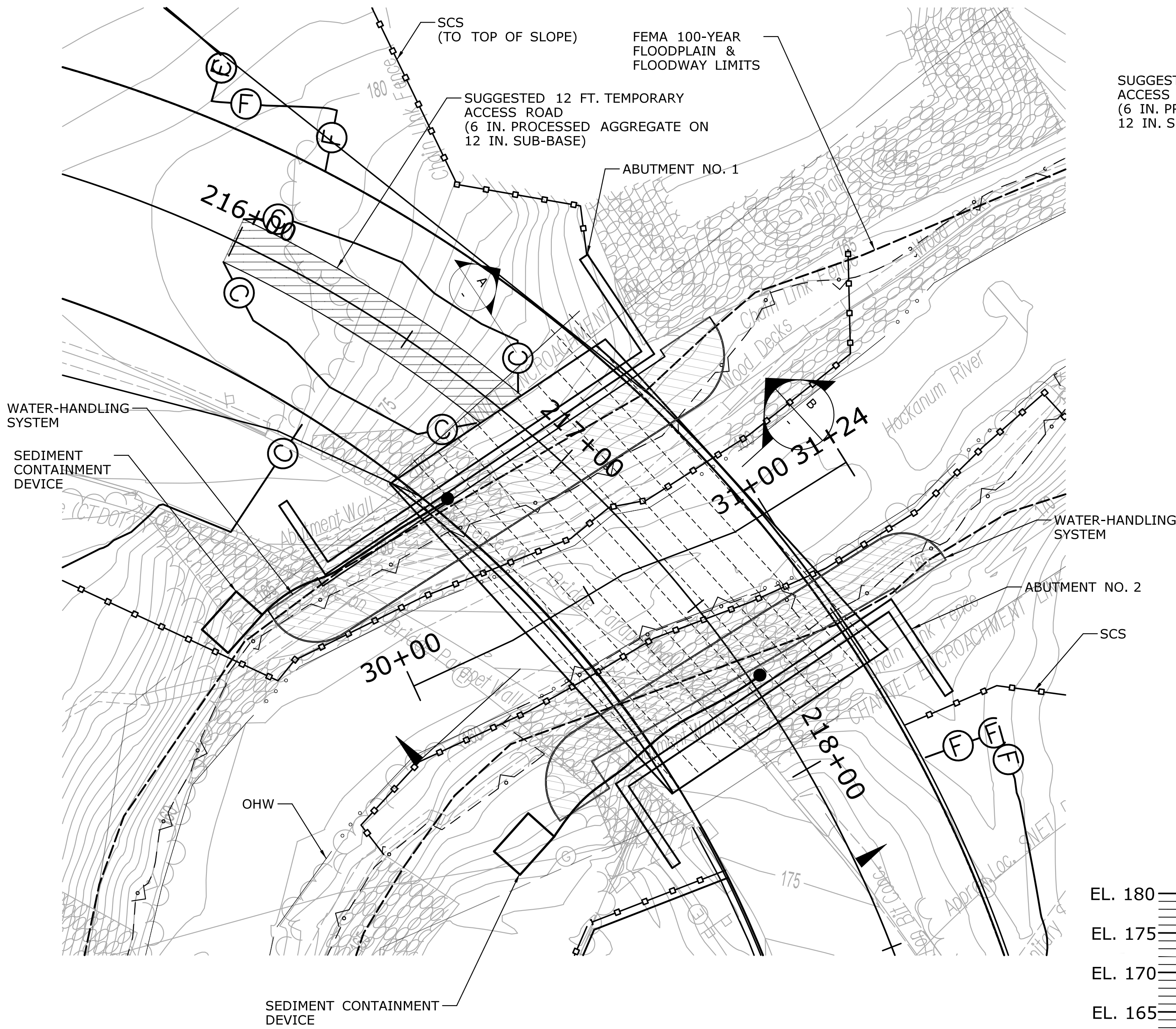
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OFFICE OF ENGINEERING	MATTHEW R. VAIL
	12/1/2014

PROJECT TITLE:	TOWN:	PROJECT NO.
IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN OF MANCHESTER	76-193
		DRAWING NO. PER-03
		SHEET NO.

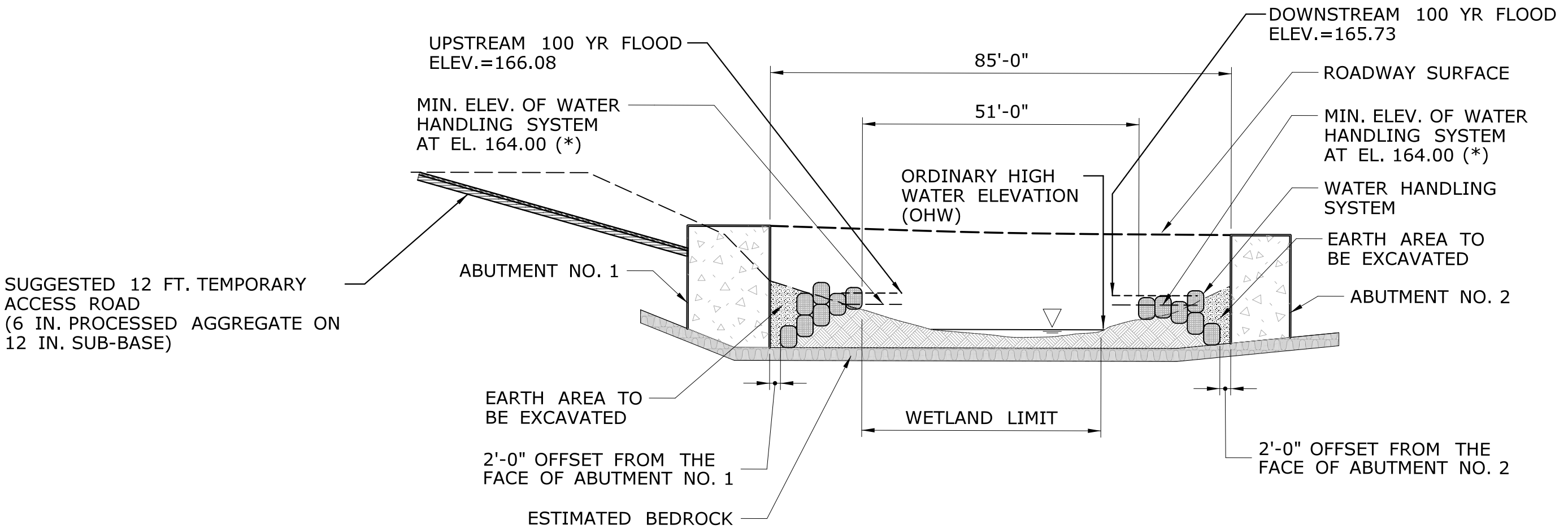
DRAWING TITLE:
SEDIMENT TRAP SITE 2 ENV. PERMIT PLANS

GENERAL NOTES

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2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
3. ALL FINAL GRADES ADJACENT TO BRIDGE ABUTMENTS MUST MATCH GRADES EXISTING PRIOR TO EXCAVATION. SEE GRADING DETAIL ON PER-05.



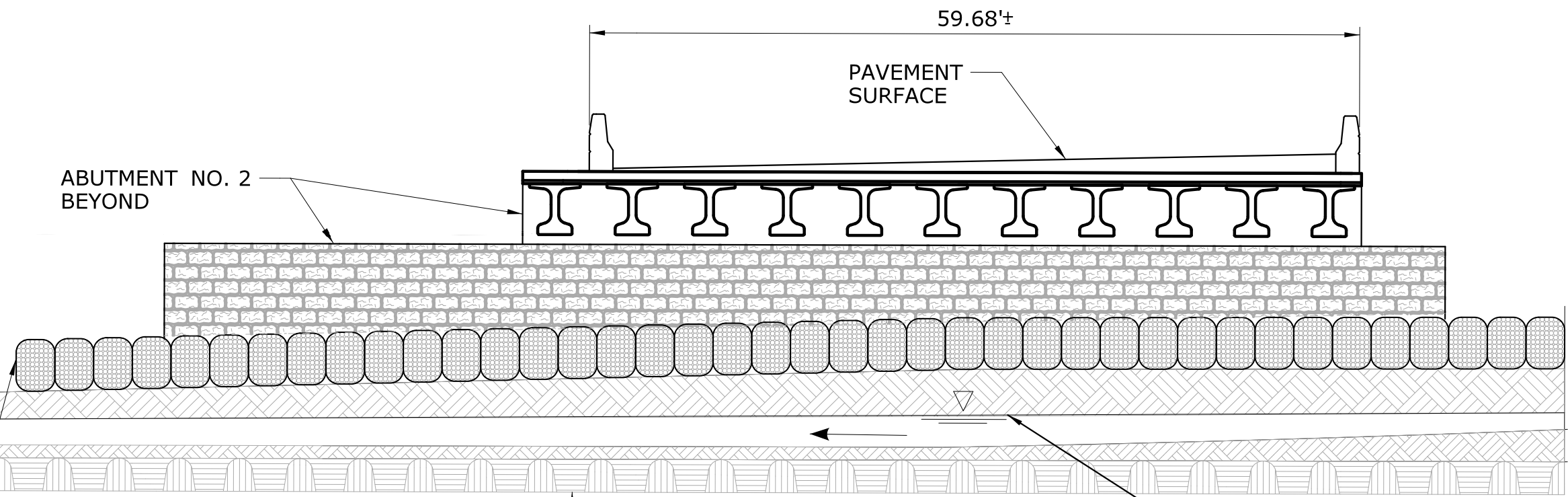
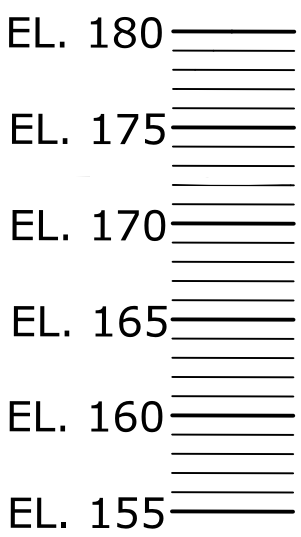
SITE 1



CROSS SECTION - BRIDGE CENTER

SCALE: 1" = 20'

Temporary Hydraulic Facilities Data Table	
Average Daily Flow	85 cfs
Average Spring Flow	164 cfs
2 - year Frequency Discharge	820 cfs
Temporary Design Discharge	1330 cfs
Temporary Design Frequency	5-year
Temporary Water Surface Elevation Upstream	163.6 ft
Temporary Water Surface Elevation Downstream	162.7 ft



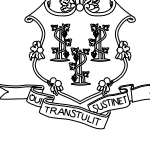

SECTION

SCALE: 1" = 10'

NOTE

(*) REQUIRED FOR A 5-YEAR STORM EVENT

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

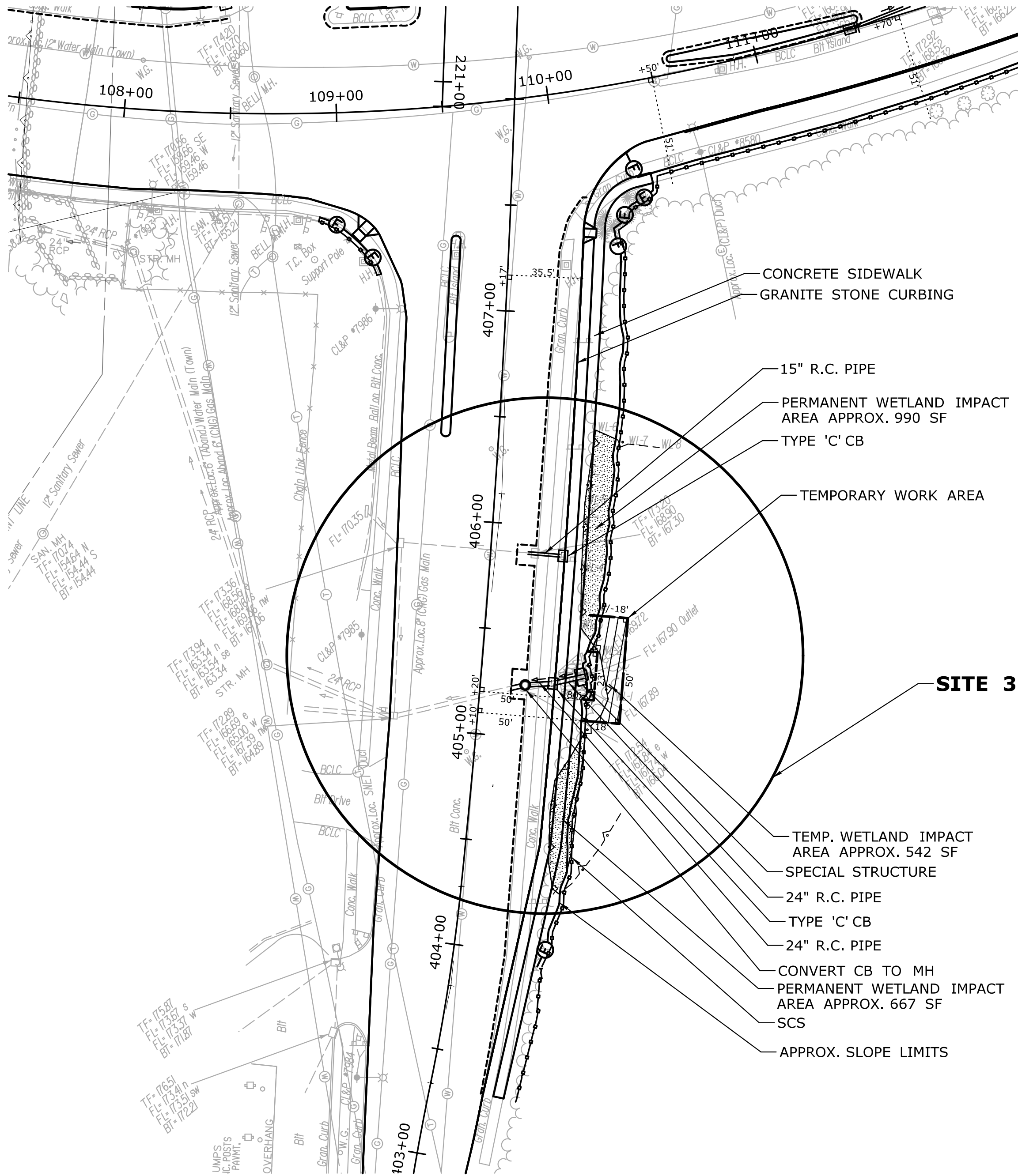
DESIGNER/DRAFTER: CZ	 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		SIGNATURE/ BLOCK: OFFICE OF ENGINEERING	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER	PROJECT NO. 76-193
CHECKED BY: MV			APPROVED BY: MATTHEW R. VAIL 12/1/2014			
SCALE AS NOTED	Filename: ...\\VHW_PER_0076_0193_PER_04.dgn				DRAWING TITLE: WATER HANDLING PLAN ENV. PERMIT PLANS	SHEET NO.
REV. DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014			

[illegible]

GENERAL NOTES

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- THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.

WETLAND SITE AREA, CUT, & FILL INFORMATION					
WETLAND SITE NO.	AREA OF WETLAND IMPACT (SF) [AC.]	FILL (CY)	EXCAVATION (CY)	RIPRAP (CY)	GRANULAR FILL (CY)
3	542 [.012] TEMP.	-	-	-	-
3	1657 [.038] PERM.	115	-	-	-



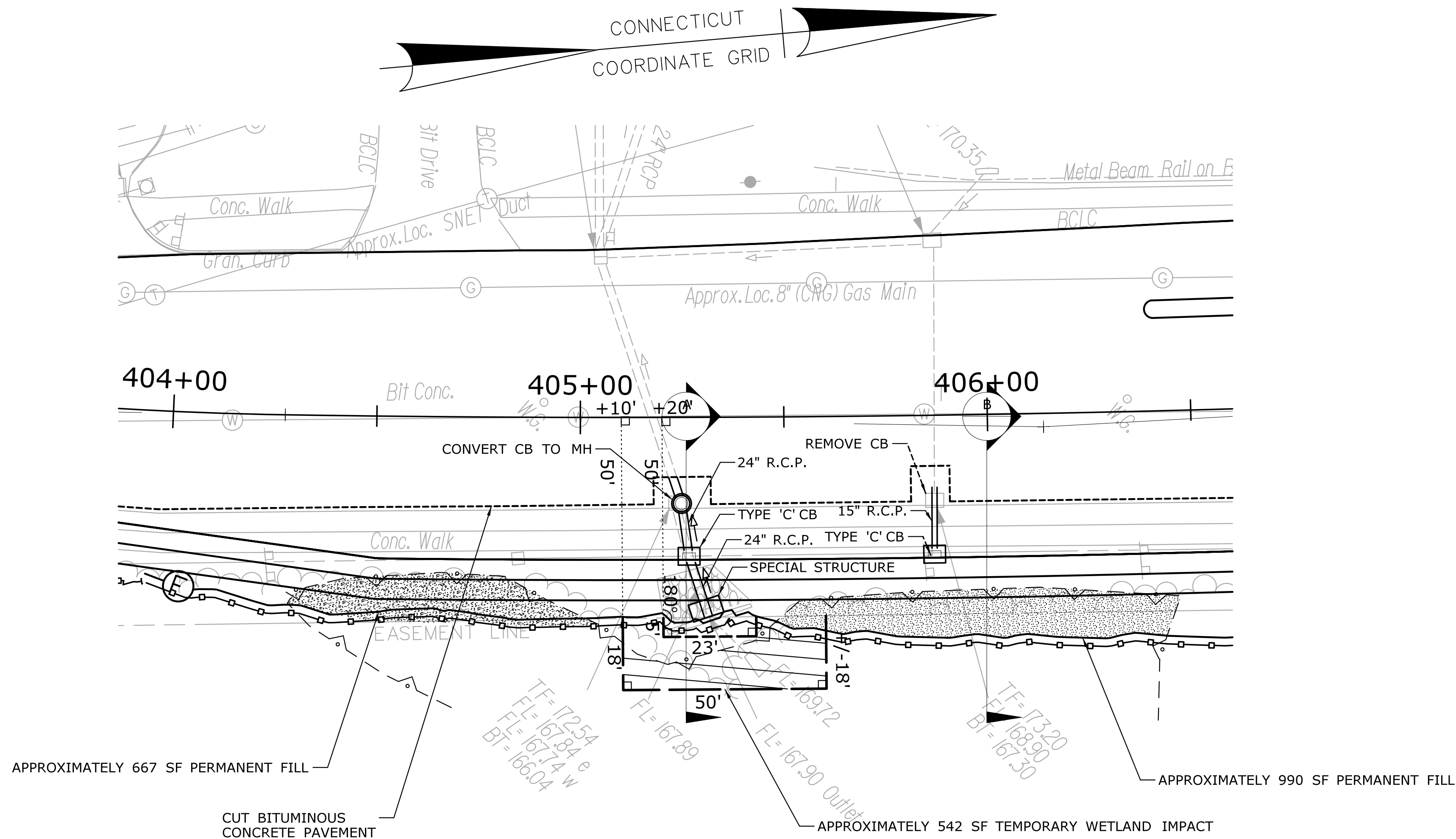
SITE 3 ENVIRONMENTAL PLAN

LEGEND

- SEDIMENTATION CONTROL SYSTEM (SCS)
- TEMPORARY WETLAND IMPACT AREA
- PERMANENT WETLAND IMPACT AREA

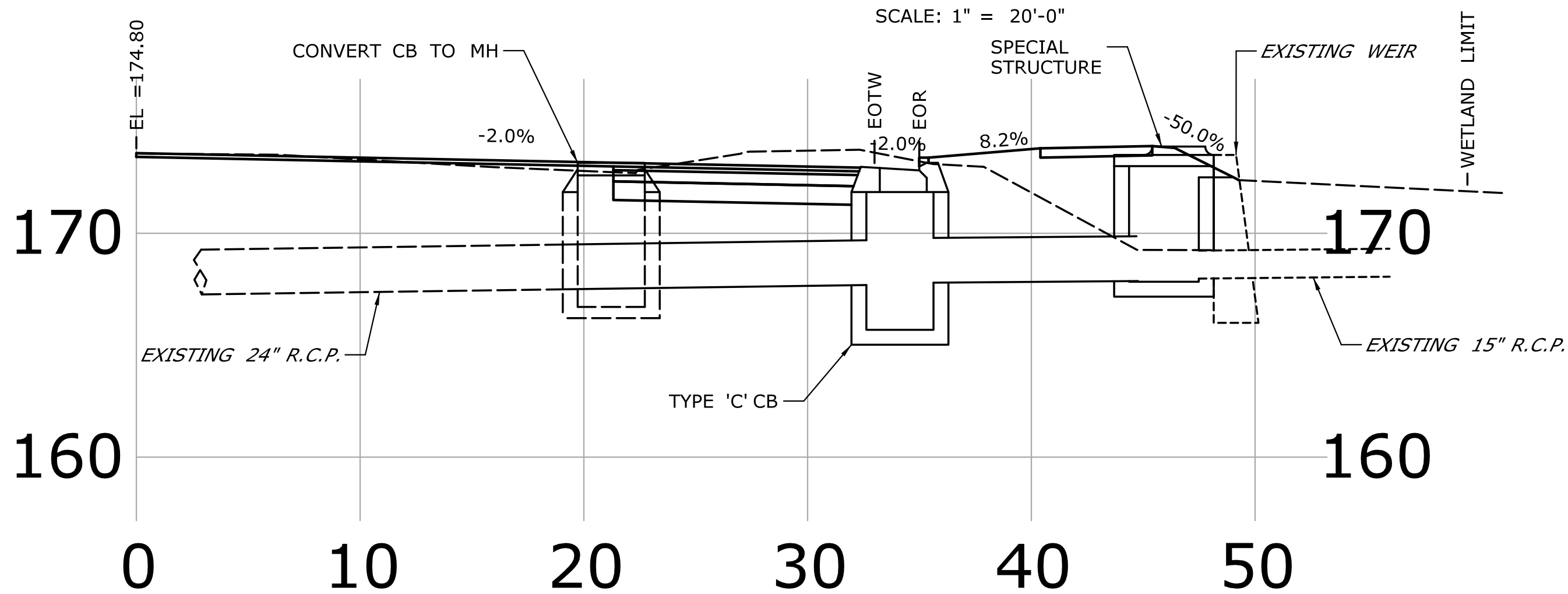
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

DESIGNER/DRAFTER: CZ	CHECKED BY: MV	SCALE AS NOTED	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING	APPROVED BY: MATTHEW R. VAIL	12/1/2014	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER	PROJECT NO. 76-193
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014	DRAWING TITLE: SITE 3 ENV. PERMIT PLANS				DRAWING NO. PER-06



PLAN VIEW - SITE 3

SCALE: 1" = 20'-0"

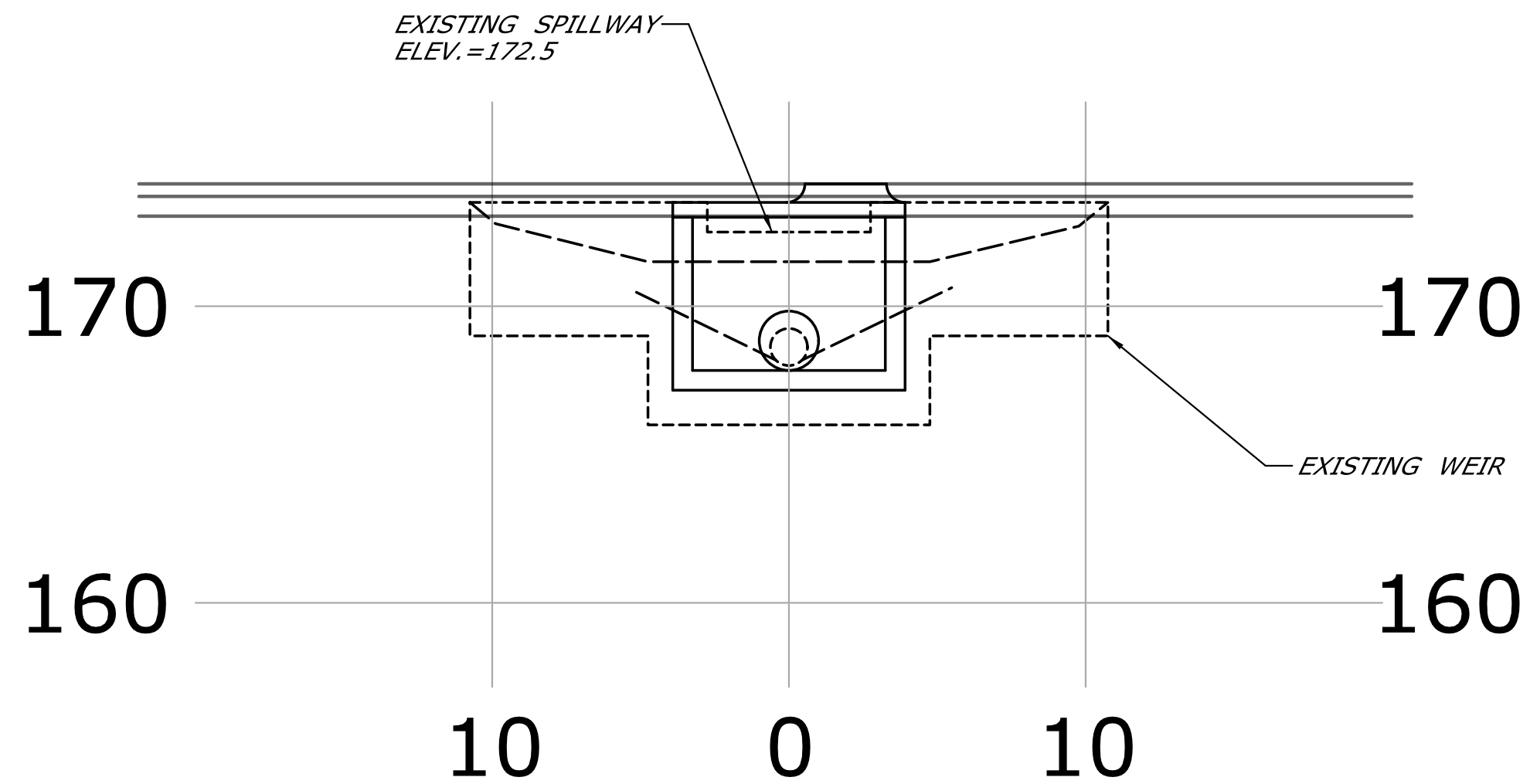


HALF SECTION - STA. 405+34

SCALE: 1" = 5'-0"

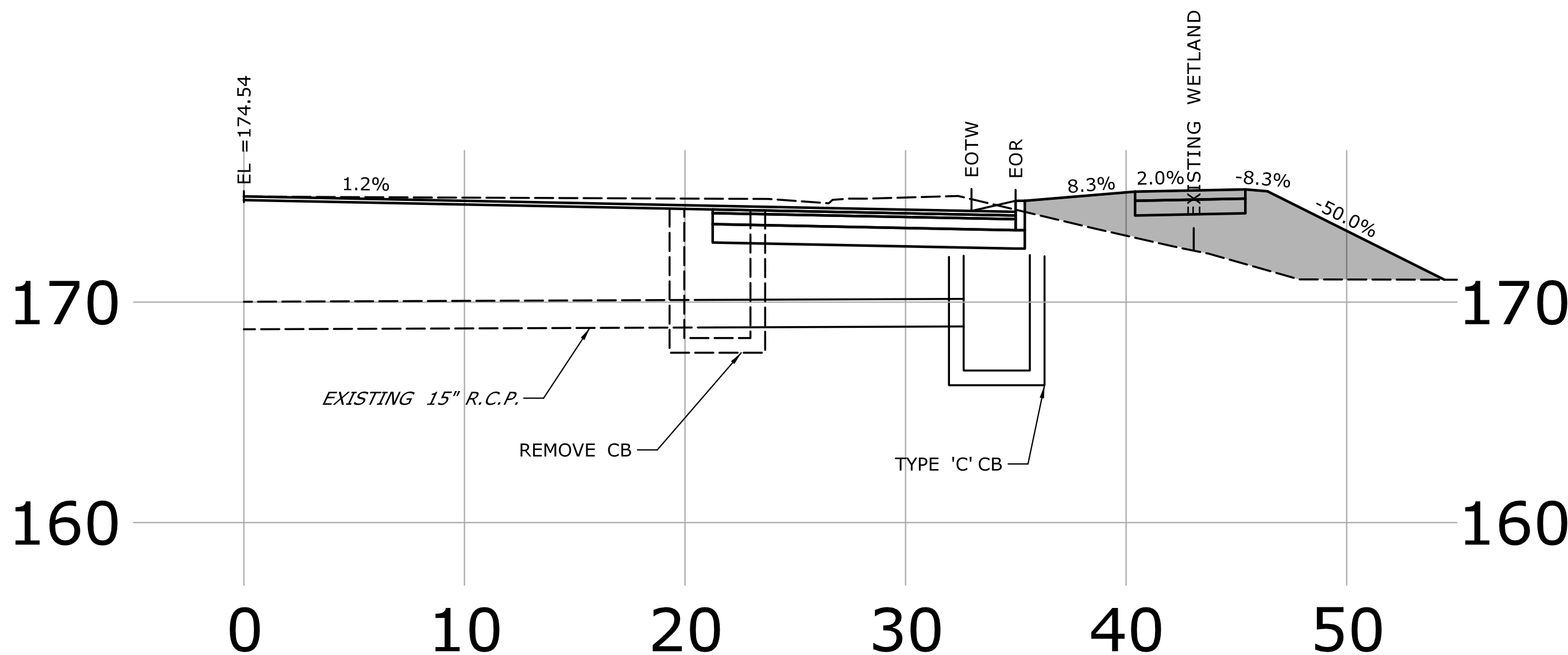
GENERAL NOTES

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2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.



ELEVATION - SPILLWAY OUTLET STRUCTURE

SCALE: 1" = 5'-0"



HALF SECTION - STA. 406+00

SCALE: 1" = 5'-0"

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

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-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/1/2014

DESIGNER/DRAFTER:
CZ

CHECKED BY:
MV

SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...VHW_PER_0076_0193_PER_07.dgn

SIGNATURE/
BLOCK:
OFFICE OF ENGINEERING

APPROVED BY:
MATTHEW R. VAIL **12/1/2014**

PROJECT TITLE:
**IMPROVEMENTS ON I-84 EXIT 63
OFF-RAMP AND INTERSECTION
OF ROUTES 30 & 83**

TOWN:
TOWN OF MANCHESTER

DRAWING TITLE:
**RTE. 83 FILL EMBANKMENT
ENV. PERMIT PLANS**

PROJECT NO.
76-193

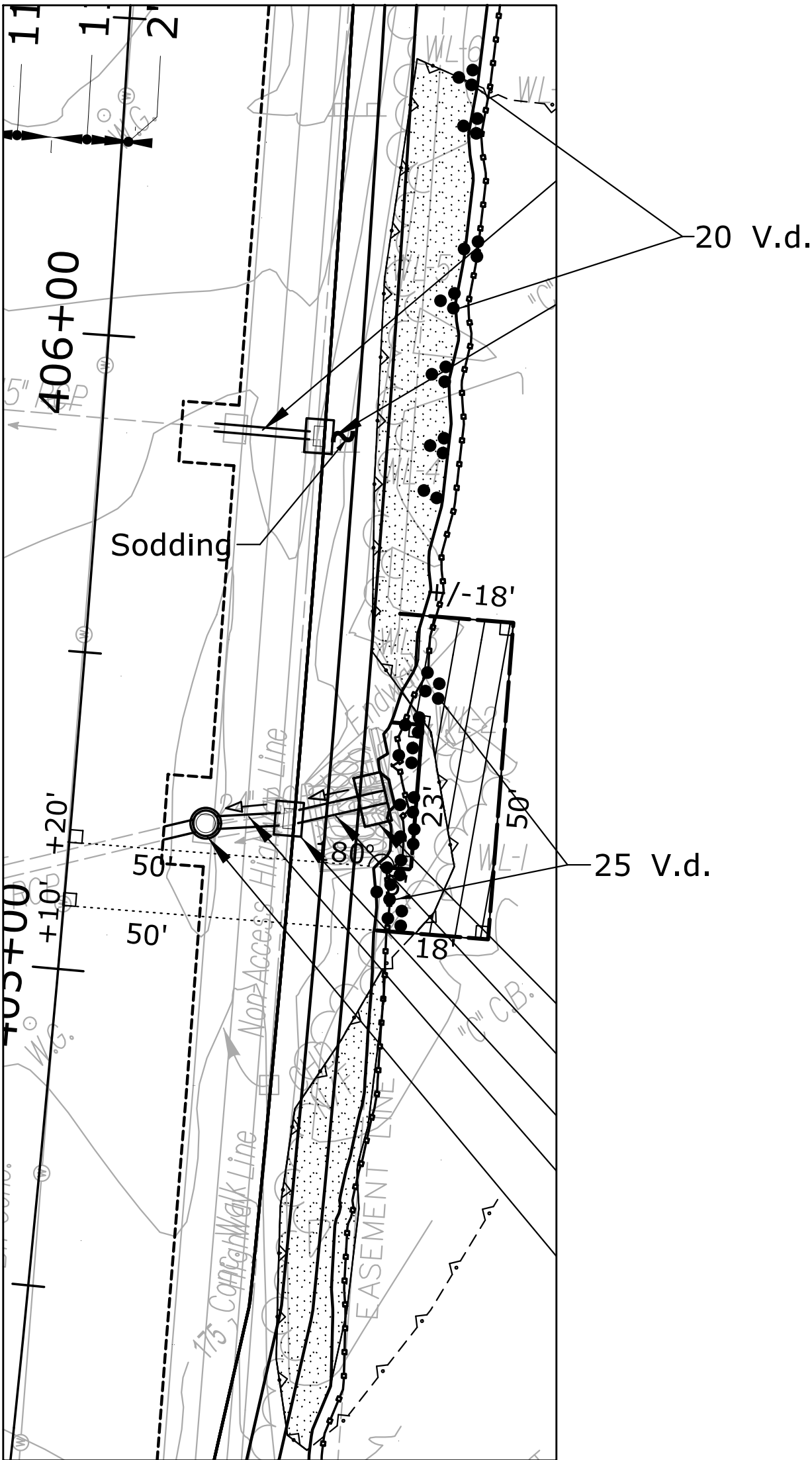
DRAWING NO.
PER-07

SHEET NO.

GENERAL NOTES

1.
- THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES.THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.

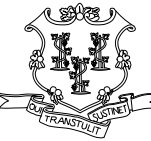
2.
- THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.



PLANT LIST					
KEY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	COMMENTS
V.d	<i>Viburnum dentatum</i>	Arrowwood Viburnum	18"-24" Ht. B.B.	4' On Center	

*QUANTITY OF PLANTS SUBJECT TO CHANGE DUE TO FIELD CONDITIONS

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

<div><div>-</div><div>-</div><div>-</div><div>-</div><div>-</div><div>-</div><div>-</div></div>			THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.		DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE IN FEET 0 20 40 SCALE 1"=20'	<div>STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION</div> <div>Filename: ...\\HW.PER_0076_0193.PER_08.dgn</div>	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: MATTHEW R. VAIL 12/1/2014		PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83		TOWN: TOWN OF MANCHESTER DRAWING TITLE: SITE PLANTINGS ENV. PERMIT PLANS		PROJECT NO. 76-193 DRAWING NO. PER-08 SHEET NO.
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014									

The Army Corps of Engineers

Attachment B

Site Photos

**ATTACHMENT B
OTHER INFORMATION
PROJECT 76-193**

Wetland Site 1:



South Side of Bridge Facing East



South Side of Bridge Facing West

**ATTACHMENT 5
OTHER INFORMATION
PROJECT 76-193**



South Side of Bridge Facing North-West

Wetland Site 2:



South-East Side of Fence Facing North

**ATTACHMENT 8
OTHER INFORMATION
PROJECT 76-193**



North Side of Fence Facing South



North Side of Bridge Facing East

**ATTACHMENT 3
OTHER INFORMATION
PROJECT 76-193**



West Side of Fence Facing East

Wetland Site 3:



Weir Structure

**ATTACHMENT 6
OTHER INFORMATION
PROJECT 76-193**



Route 83 Facing South



Route 83 Facing South

**ATTACHMENT B
OTHER INFORMATION
PROJECT 76-193**



Route 83 Facing North

The Army Corps of Engineers

Attachment C

Wetland Data Sheets/ Function & Values

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CTDOT 76-193 City/County: Manchester Sampling Date: 9/17/2013

Applicant/Owner: CTDOT State: CT Sampling Point: 76-193 WL-1

Investigator(s): CWS Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local Relief (concave, convex, none): CONCAVE

Slope (%): 0 Lat: 41°25'15.433"N Long: 72°29'31.309"W Datum: NAD83

Soil Map Unit Name: 12-Raypol silt loam NWI Classification: _____

Are Climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks).

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (if needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point location, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Hydric Soil Present	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
If yes, optional Wetland Site ID: _____		

Remarks: (Explain alternative procedures here or in a separate report)

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required: check all that apply)		
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)
<input checked="" type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)
		<input type="checkbox"/> FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches): _____	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Water Table Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Depth (inches): <u>12"</u>	
Saturation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Depth (inches): <u>SURFACE</u>	
(includes capillary fringe)			

Describe Recorded Data (stream gauge, monitoring well, aerial photographs, previous inspections), if available:

Remarks:

SOIL

Sampling Point: 06665 WL-1

[illegible]

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CTDOT 76-193 City/County: MANCHESTER Sampling Date: 9/17/2013
 Applicant/Owner: CTDOT State: CT Sampling Point: UPL-1
 Investigator(s): CWS Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): SLOPE Local Relief (concave, convex, none): NONE
 Slope (%): 45% Lat: 41.810°N Long: -72.522°W Datum: Decimal Degrees
 Soil Map Unit Name: 12- Raypoil silt loam NWI Classification: _____
 Are Climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks).
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐
 Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point location, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, optional Wetland Site ID: _____
Hydric Soil Present Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

Remarks: (Explain alternative procedures here or in a separate report)

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required: check all that apply)		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)
		<input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations:		
Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____		
Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)		
Describe Recorded Data (stream gauge, monitoring well, aerial photographs, previous inspections), if available:		
Remarks:		

SOIL

Sampling Point: 76-193 UPL-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- | | |
|---|--|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Polyvalue Below Surface (S8) (LRR R, MLRA 149B) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Thin Dark Surface (S9) (LRR R, MLRA 149B) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Loamy Mucky Mineral (F1) (LRR K, L) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) | <input type="checkbox"/> Redox Depression (F8) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | |
| <input type="checkbox"/> Sandy Redox (S5) | |
| <input type="checkbox"/> Stripped Matrix (S6) | |
| <input type="checkbox"/> Dark Surface (S7) (LRR R, MLRA 149B) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (LRR K, L, MLRA 149B)
☐ Coast Prairie Redox (A16) (LRR K, L, R)
☐ 5 cm Mucky Peat or Peat (S3) (LRR K, L, R)
☐ Dark Surface (S7) (LRR K, L)
☐ Polyvalue Below Surface (S8) (LRR K, L)
☐ Thin Dark Surface (S9) (LRR K, L)
☐ Iron-Manganese Masses (F12) (LRR K, L, R)
☐ Piedmont Floodplain Soils (F19) (MLAR 149B)
☐ Mesic Spodic (TA6) (MLRA 144A, 145, 149B)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

ENVIRONMENTAL REPORT

CTDOT 76-193

005234 o/Hockanum River, Interstate 84 EB Exit 63 Off-Ramp and Intersection of Routes 30 & 83 Manchester, Connecticut

Introduction

This project encompasses the I-84 eastbound Exit 63 off-ramp including improvements to the Route 30 and Route 83 approaches in the Town of Manchester. There are three regulated sites affected by construction activities with a total regulated area impact of 0.156 acres (6,799 sq. ft.). The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp, as well as intersection improvements along Routes 30 and 85. The new off-ramp alignment will require the replacement of the existing bridge (Site 1), minor drainage modifications including cleaning out an existing basin (Site 2), and widening Route 83 on the east side (Site 3). Erosion and Sedimentation controls will be installed prior to the start of work. Allowable time periods for unconfined and confined in-stream work provided by DEEP will determine when the Contractor will be allowed to work within the Hockanum River. Best Management Practices are required to set up and remove cofferdams and dewatering systems. All water handling and dewatering will be in accordance with the *Best Management Practices* as outlined in The Departments' *Standard Specifications for Roads, Bridges and Incidental Construction Form 816*.

Existing Conditions: Site 1

This site consists of the replacement of Bridge No. 05234 which carries Interstate 84 over the Hockanum River. This area is depicted on sheet PER-02 of the Permit Plan Sheets in Attachment G. There is a mapped floodway associated with the Hockanum River in the project area. The site is not located within any public watershed or aquifer protection area. The project area falls outside habitat for any known Federal or State listed species.

There are State and Federal wetlands found along the Hockanum River at Site1. However there is no vegetative community (wetland and upland) associated with this stretch. The project area consists of large riprap down to Ordinary High Water. The Hockanum River in this stretch is characterized by a cobble/ rocky substrate. The river is approximately 20-25 feet wide with a Water Quality Classification of GA-Impaired. The flows are fast moving with riffle areas. This stretch has areas of undercut banks upstream and downstream. Functions and Value Assessments follow US Army Corps of Engineers Highway Methodology Workbook. The primary functions of the system are floodflow alteration, sediment/toxicant/pathogen retention, and sediment/shoreline stabilization. The primary functions are derived from the proximity of the wetlands to inputs of sediments/toxicants (Interstate 84). The wetland/stream complex also serves limited functions in groundwater recharge/discharge and production export. The Hockanum River provides fish and wildlife habitat. These additional functions are limited by the landscape position, adjacent to the state route, and these functions are better served beyond the project limits, as there are large undeveloped areas both up and downstream of the site. Soil types throughout this area are made up of Udorthents- Urban land complex.

sediment and down to the Hockanum River. Due to the reduction in paved surfaces throughout this drainage system, the 10 yr. flow discharging from the outlet has been reduced from 14.8 cfs down to 14.2 cfs. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel. The sediment trap will also reduce the discharge velocity of the stormwater.

The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

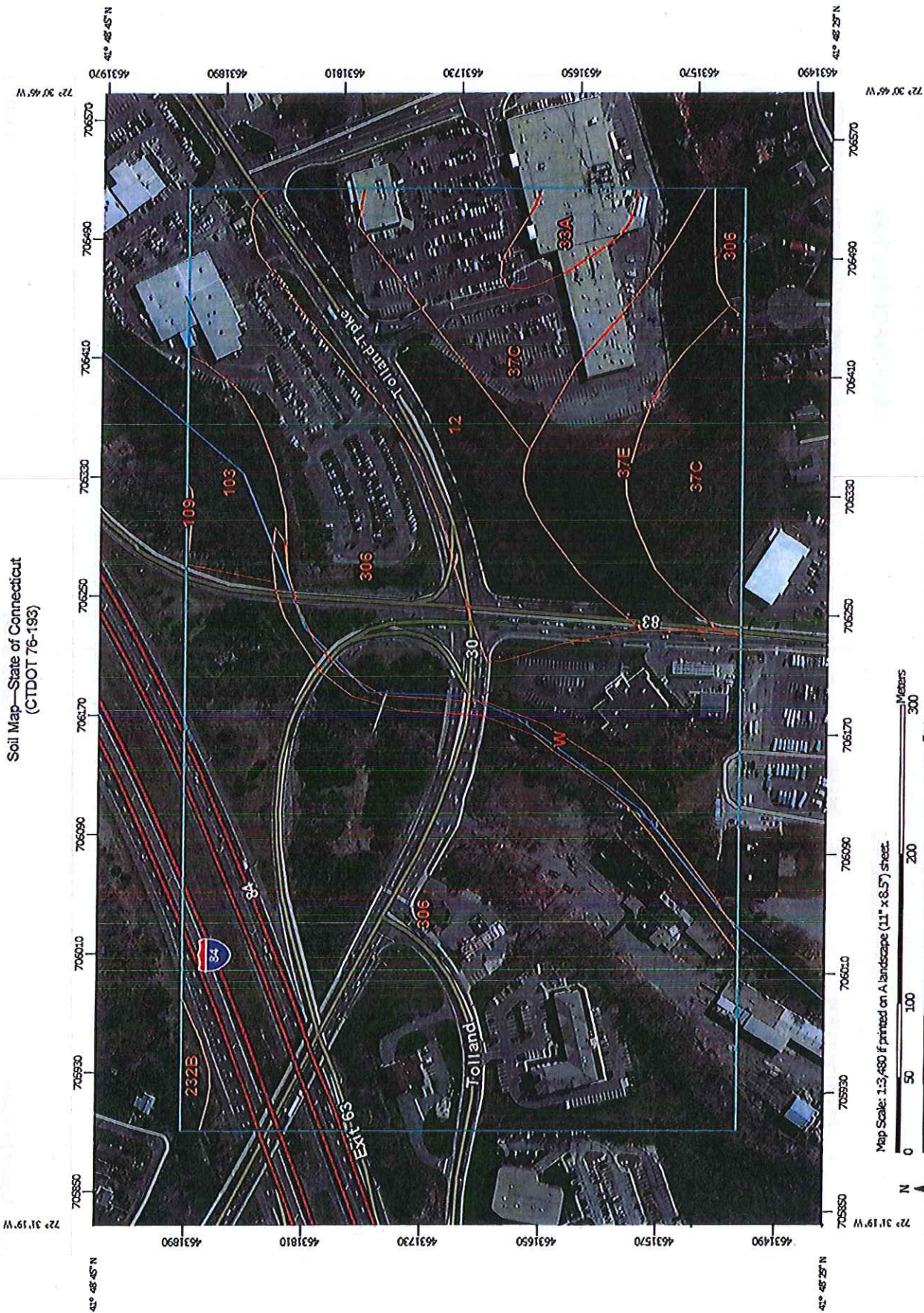
Existing Conditions: Site 3

Site 3 is associated with the widening of Route 83 that will require the placement of fill within the wetland. This area is depicted on sheet PER-03 of the Permit Plan Sheets in Attachment G. This wetland is a low swampy area covered with mature trees and brush. The water from this area flows into the state stormwater system on Route 83, eventually discharging from the system into the Hockanum River. Separating the wetland from the state's drainage system is an embankment with a concrete weir. A 15 inch HDPE pipe carries water through the embankment and weir conveying low flows to the state's 24 inch inlet pipe. The existing weir structure has been designed for an adjacent development, Stop & Shop, to use the low-lying wetland to detain flow from their site. Larger flows fill the wetland area until eventually they flow over the weir and into the state system. There are no mapped FEMA floodplain or floodway areas associated with this project site. This impact area is not within any mapped watershed or aquifer protection area. Coordination with CTDEEP Natural Diversity Database has determined that this project site is not located in an area identified as habitat for State listed species.

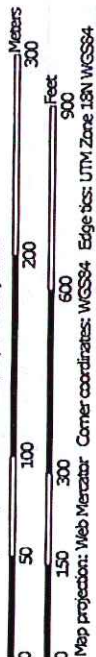
Areas of state and federal wetland are found within this lowland flood retention area. The vegetative community (wetland and upland) within this site consists of red maple (*Acer rubrum*), white oak (*Quercus alba*), sweet birch (*Betula lenta*), gray birch (*Betula populifolia*), and yellow birch (*Betula allegheniensis*) within the canopy. The shrub layer is dominated by red maple, mountain laurel (*Kalmia latifolia*), highbush blueberry (*Vaccinium corymbosum*), buttonbush (*Cephalanthus occidentalis*) and witch hazel (*Hamamelis virginiana*). The herbaceous layer is dominated by witch hazel, white oak, white pine (*Pinus strobus*), Japanese stiltgrass (*Microstegium vimineum*)*, tussock sedge (*Carex stricta*), arrowleaf tearthumb (*Persicaria sagittata*), meadowsweet (*Spiraea alba*), and mountain laurel.

This wetland area is characterized with flows that are slow moving with riffle areas. This lowland wetland system has a Water quality Classification of GA-Impaired. Functions and Value Assessments follow US Army Corps of Engineers Highway Methodology Workbook. The primary functions of the system are floodflow alteration and sediment/toxicant/pathogen retention. The primary functions are derived from the proximity of the wetlands to inputs of sediments/toxicants (State Route 85). The wetland/stream complex also serves limited functions in groundwater recharge/discharge, production export, and wildlife habitat. These additional functions are limited by the landscape position, adjacent to the state route. Soil types throughout this area are made up of Raypol silt loam and Manchester gravelly sandy loam.

Soil Map—State of Connecticut (CTDOT 76-193)



Map Scale: 1:3,480 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ties: UTM Zone 18N WGS84

USDA
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

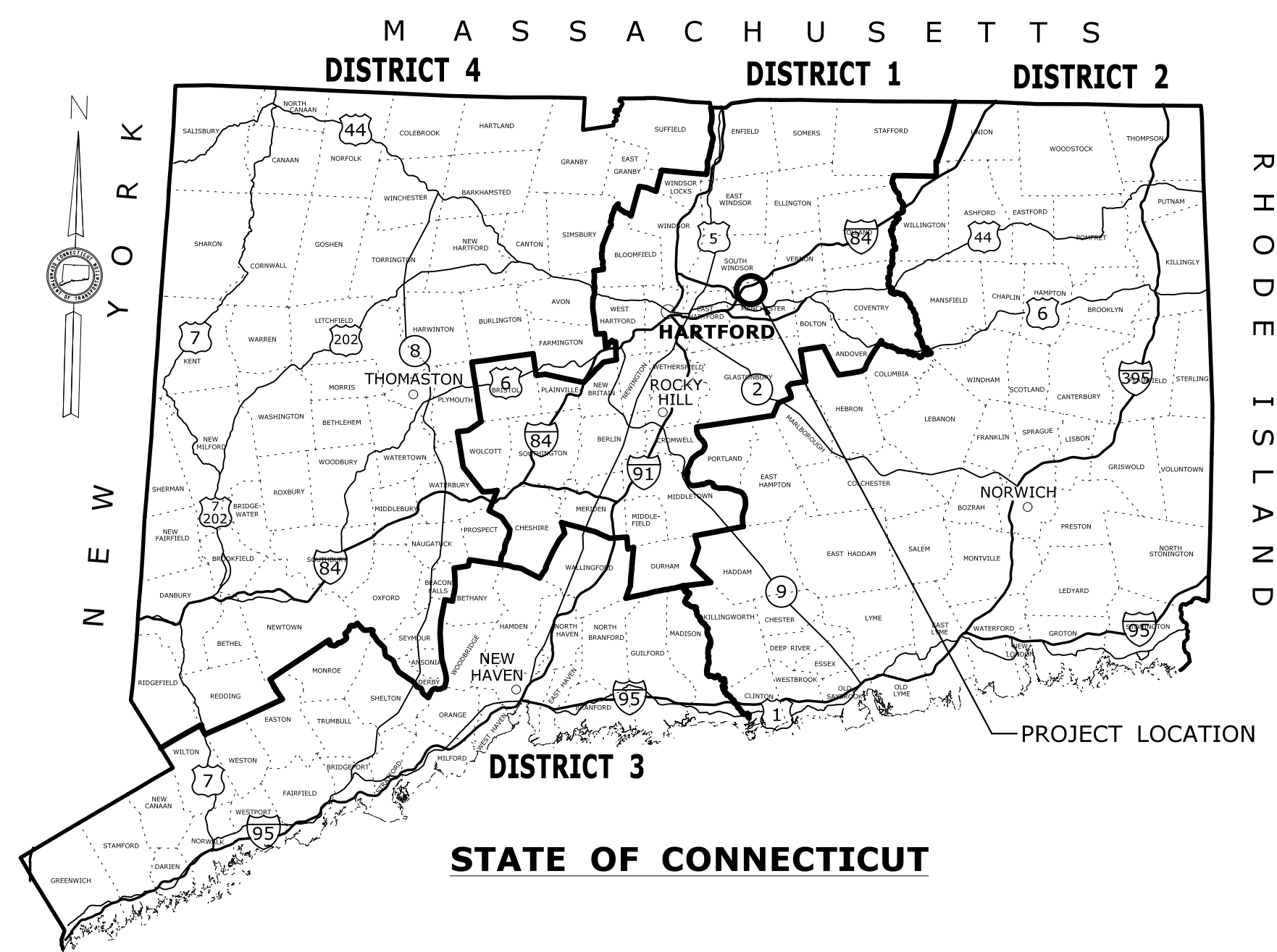
Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypoil silt loam	6.1	10.3%
33A	Hartford sandy loam, 0 to 3 percent slopes	1.0	1.7%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	7.5	12.6%
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	4.1	6.9%
103	Rippowam fine sandy loam	1.8	3.1%
109	Fluvaquents-Udifuvents complex, frequently flooded	0.0	0.1%
232B	Haven-Urban land complex, 0 to 8 percent slopes	0.3	0.5%
306	Udorthents-Urban land complex	37.3	63.1%
W	Water	1.1	1.8%
Totals for Area of Interest		59.1	100.0%

**ATTACHMENT G
PLAN SHEETS AND DRAWINGS
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

Please see the environmental plan sheets to be included in the contract documents for construction of the project.

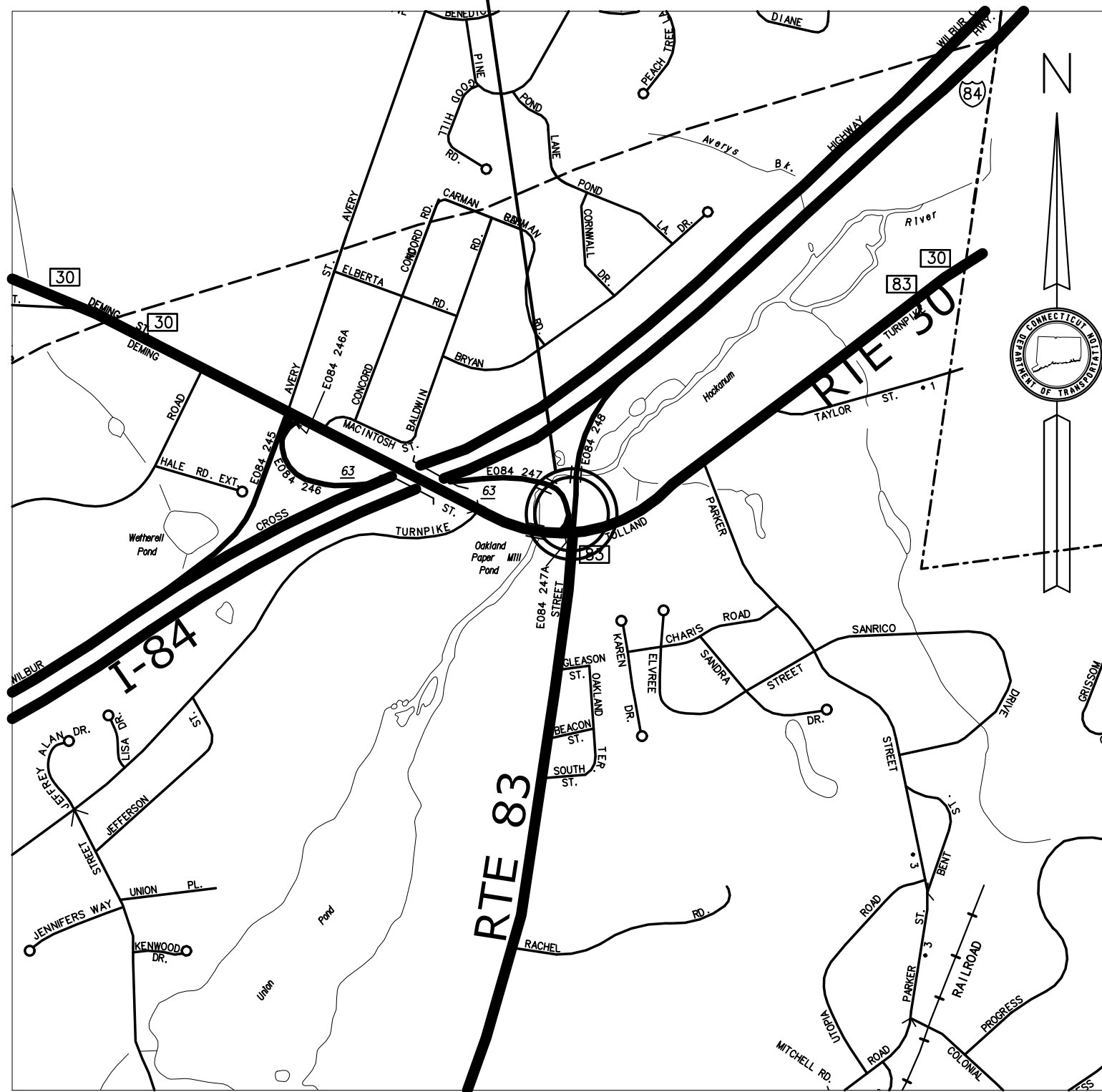


ENVIRONMENTAL PERMIT PLANS
IMPROVEMENTS ON I-84 EXIT 63 EB
OFF-RAMP AND INTERSECTION OF
ROUTE 30 & ROUTE 83
TOWN OF MANCHESTER
STATE PROJECT NO. 0076-0193

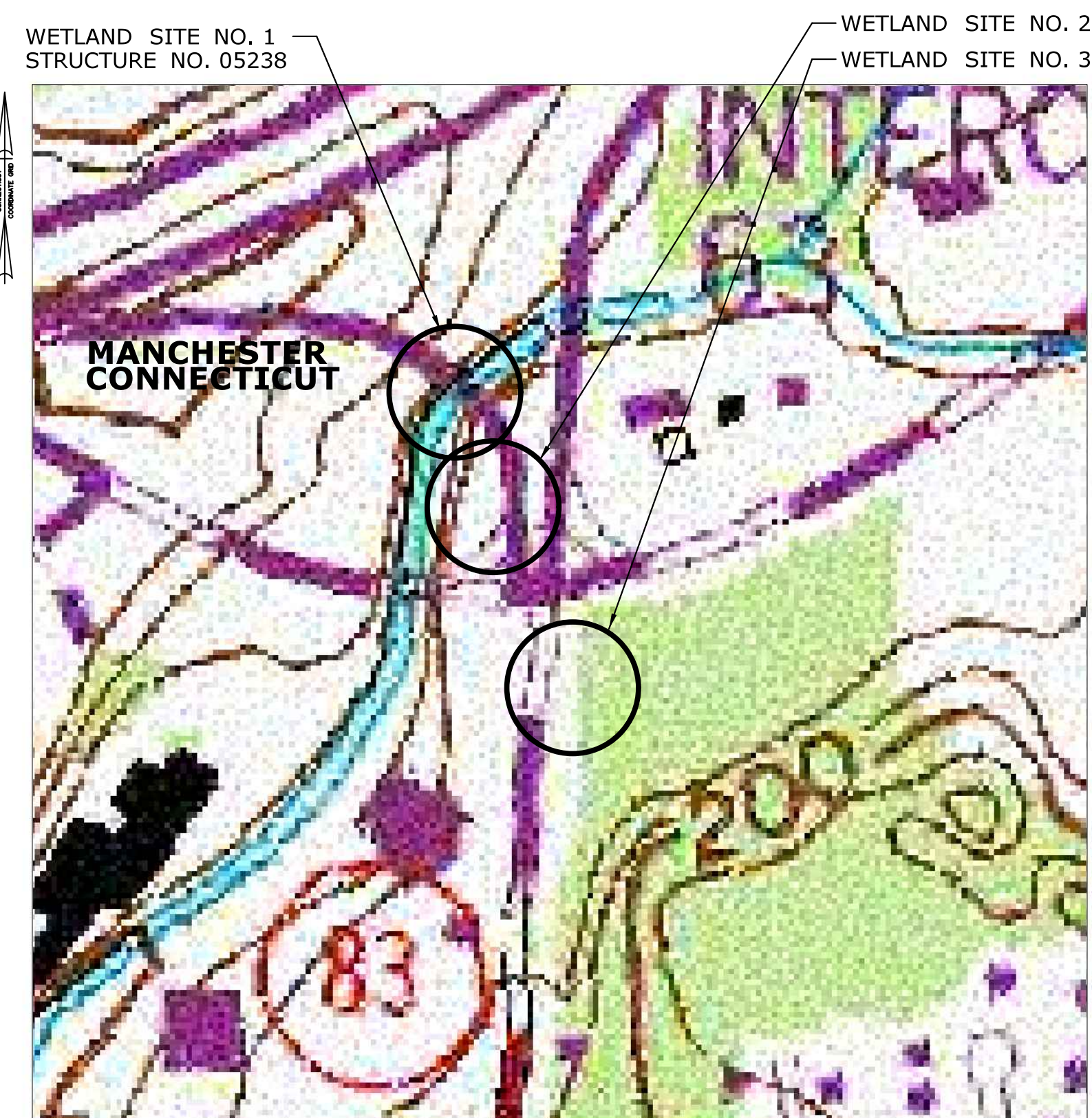
GENERAL NOTES:

1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
2. ALL PERTINENT INFORMATION SUBJECT TO THE IMPACT OF THE WETLANDS IS SHOWN AND CALLED OUT IN THE ENCLOSED CIRCLES. TECHNICAL REVISIONS WILL BE SUBMITTED TO DEEP WHEN THE DOT MAKES DESIGN CHANGES FOR THOSE ITEMS CALLED OUT IN THE ENCLOSED CIRCLES, OR FOR ANY ROADWAY CONSTRUCTION THAT IMPACTS THE REGULATED AREAS.
3. THE CONTRACTOR SHALL PREPARE EROSION AND SEDIMENTATION CONTROL PLANS BASED ON THE CONTRACT DRAWINGS AND THE STORMWATER POLLUTION CONTROL PLAN, IN ACCORDANCE WITH SECTION 1.10 ENVIRONMENTAL COMPLIANCE, INCLUDING BEST MANAGEMENT PRACTICES. AS SPECIFIED, THE PLANS SHALL BE CONSISTENT IN ALL RESPECTS WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENTATION CONTROL, AND WITH CONNDOT'S ON-SITE MITIGATION FOR CONSTRUCTION ACTIVITIES. THE PLANS SHALL INCLUDE DETAILS OF THE PROPOSED SYSTEMS.
4. IN ALL CASES, THE CONTRACTOR SHALL IMPLEMENT STABILIZATION MEASURES AS SOON AS POSSIBLE AFTER ANY SOIL DISTURBANCE. WHERE CONSTRUCTION ACTIVITIES HAVE BEEN PERMANENTLY CEASED OR HAVE TEMPORARILY BEEN SUSPENDED FOR MORE THAN SEVEN DAYS, OR WHEN FINAL GRADES ARE REACHED IN ANY PORTION OF THE SITE, STABILIZATION PRACTICES SHALL BE IMPLEMENTED WITHIN THREE DAYS. AREAS THAT WILL REMAIN DISTURBED BUT INACTIVE FOR 30 DAYS OR MORE SHALL BE STABILIZED WITHIN THE FIRST SEVEN DAYS OF THAT PERIOD, THE CONTRACTOR SHALL COMPLY AT ALL TIMES WITH THE REQUIREMENTS OF SECTION 1.10.
5. SEE THE PERMIT APPLICATION FOR A DESCRIPTION OF THE WATERCOURSES, WETLAND AND WETLAND SOILS, AND ADDITIONAL NARRATIVE INFORMATION.
6. NOTE THAT ALL ELEVATIONS ON THIS PROJECT ARE BASED ON AN NGVD OF 1929.

PROJECT LOCATION

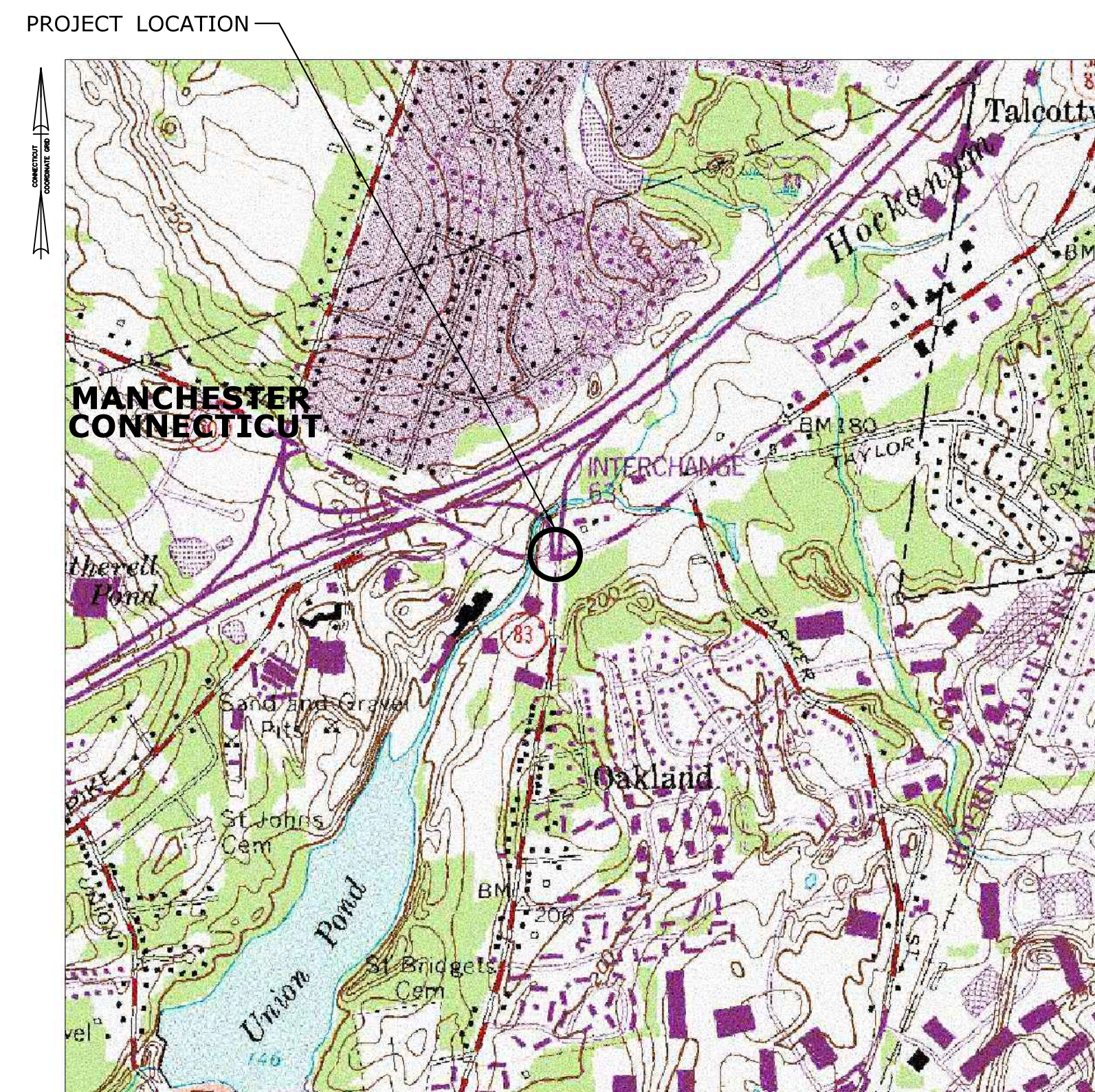


LOCATION MAP MANCHESTER
SCALE: 1" = 1000'



LOCATION OF WETLANDS

SCALE: 1" = 200'



LOCATION OF PROJECT
SCALE: 1" = 1000'

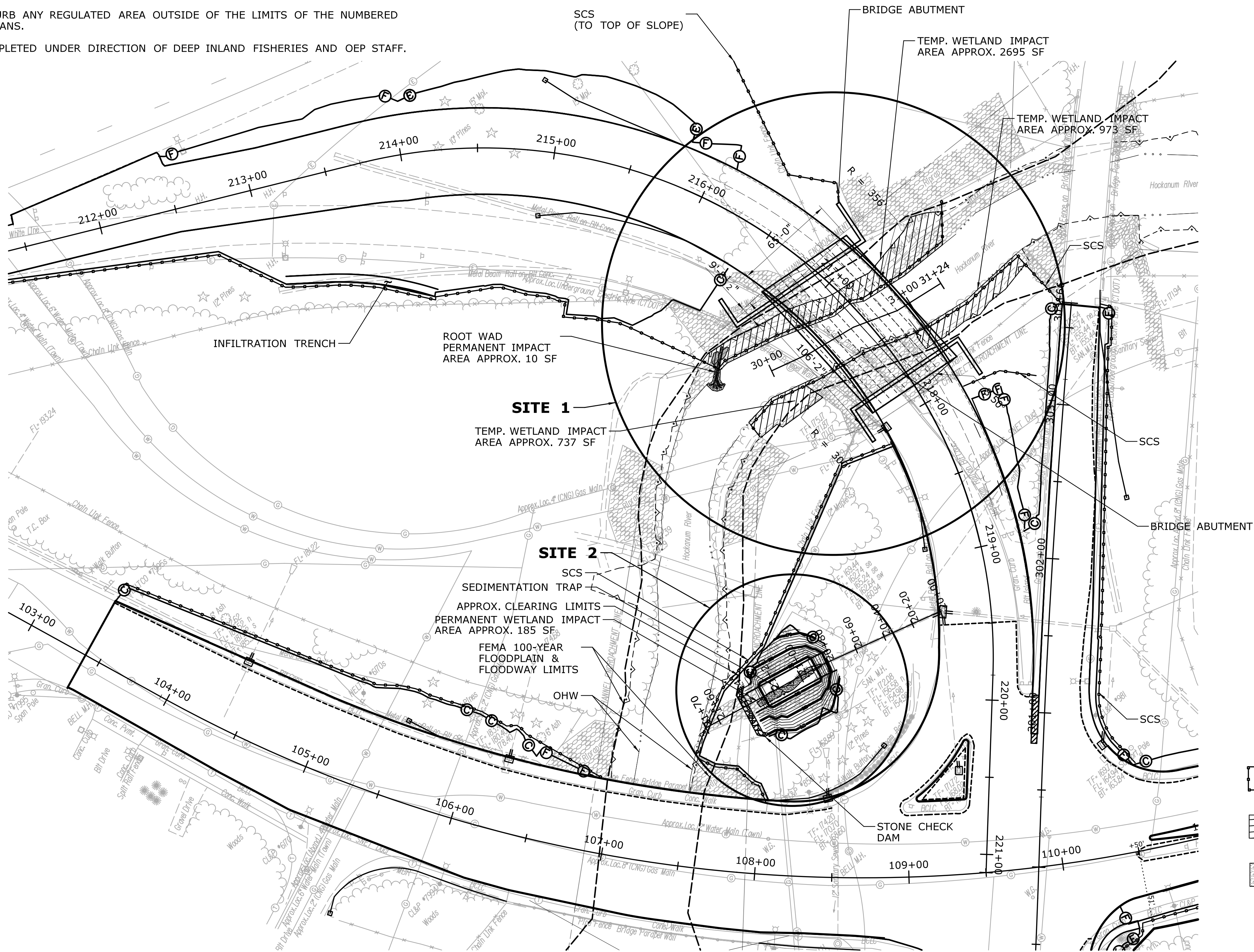
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

[illegible]

GENERAL NOTES

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2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
3. ROOT WAD PLACEMENT TO BE COMPLETED UNDER DIRECTION OF DEEP INLAND FISHERIES AND OEP STAFF.

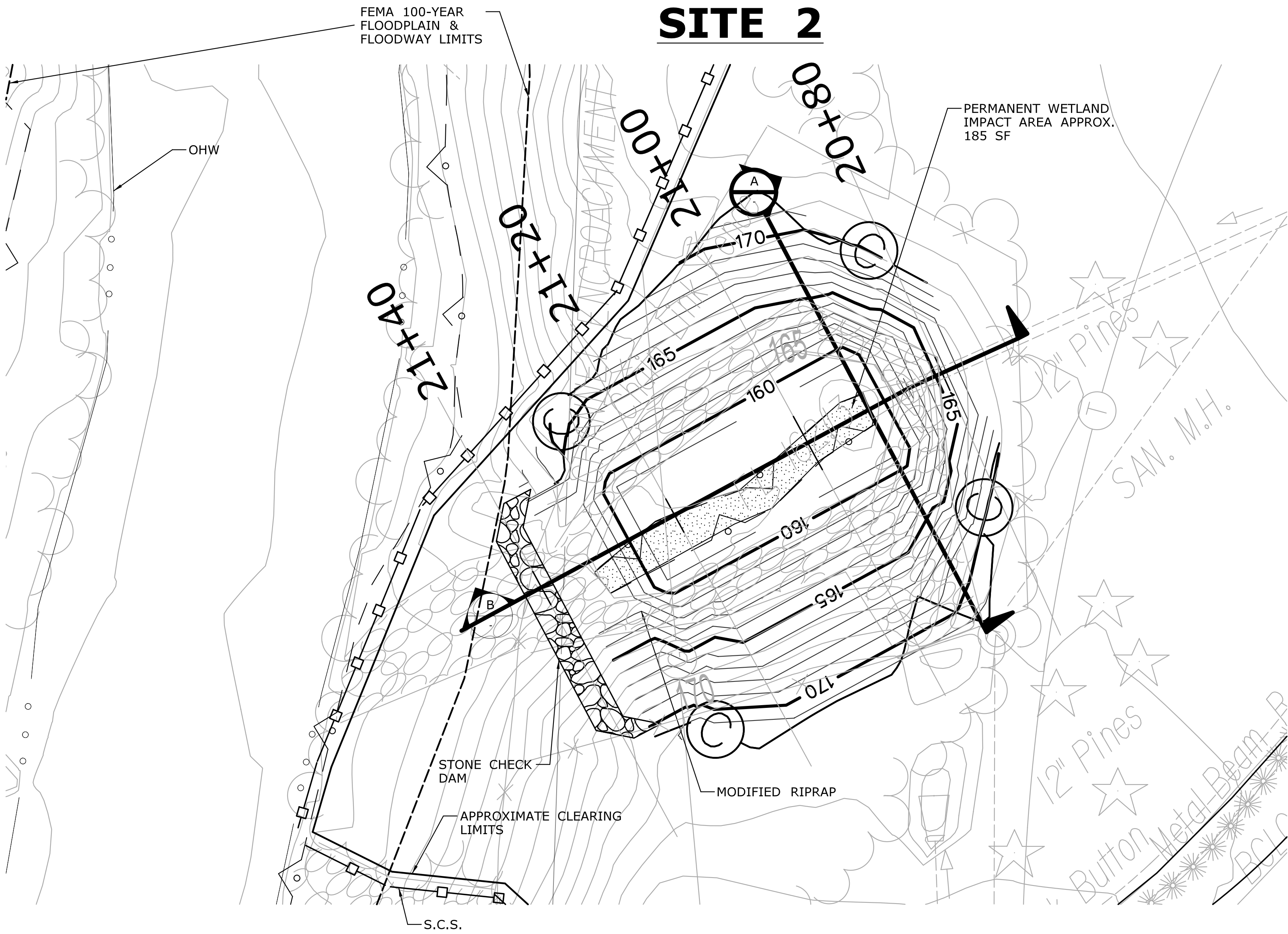
WETLAND SITE AREA, CUT, & FILL INFORMATION					
WETLAND SITE NO.	AREA OF WETLAND IMPACT (SF) [AC.]	FILL (CY)	EXCAVATION (CY)	RIPRAP (CY)	GRANULAR FILL (CY)
1	4415 [.101] TEMP.	-	-	-	-
2	185 [.004] PERM.	110	48	10.3	7



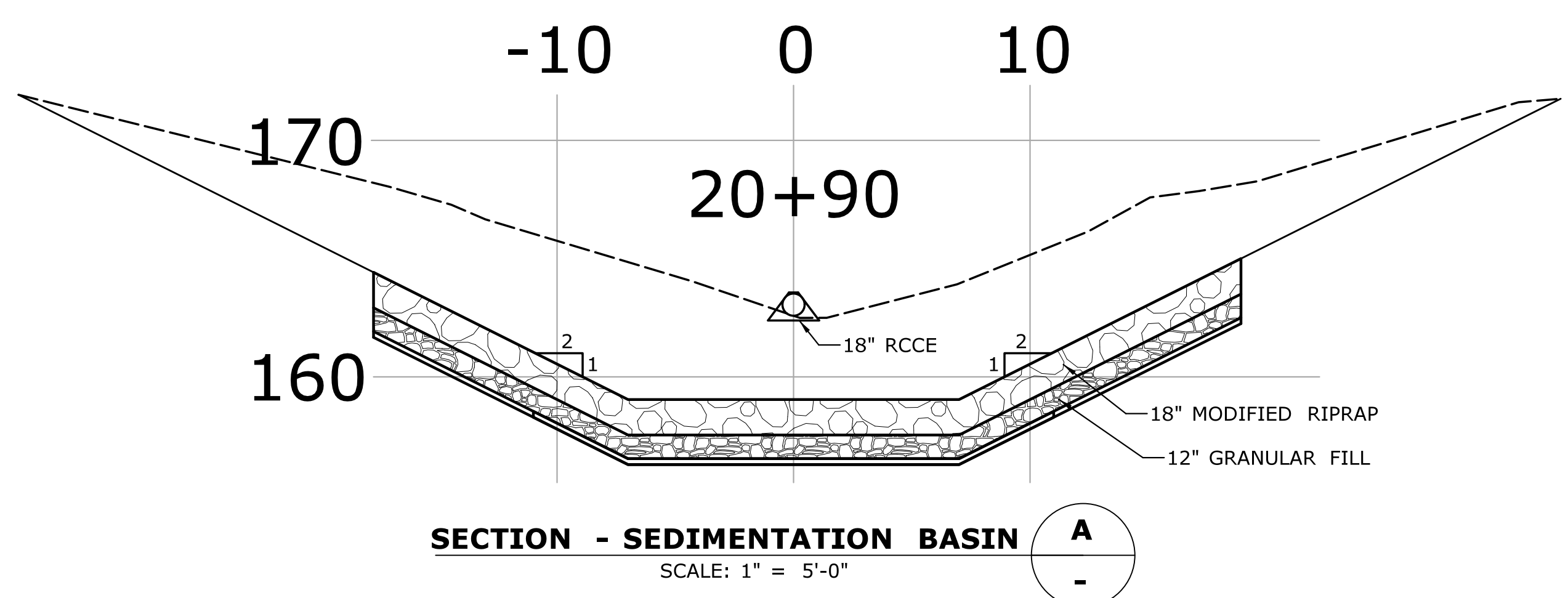
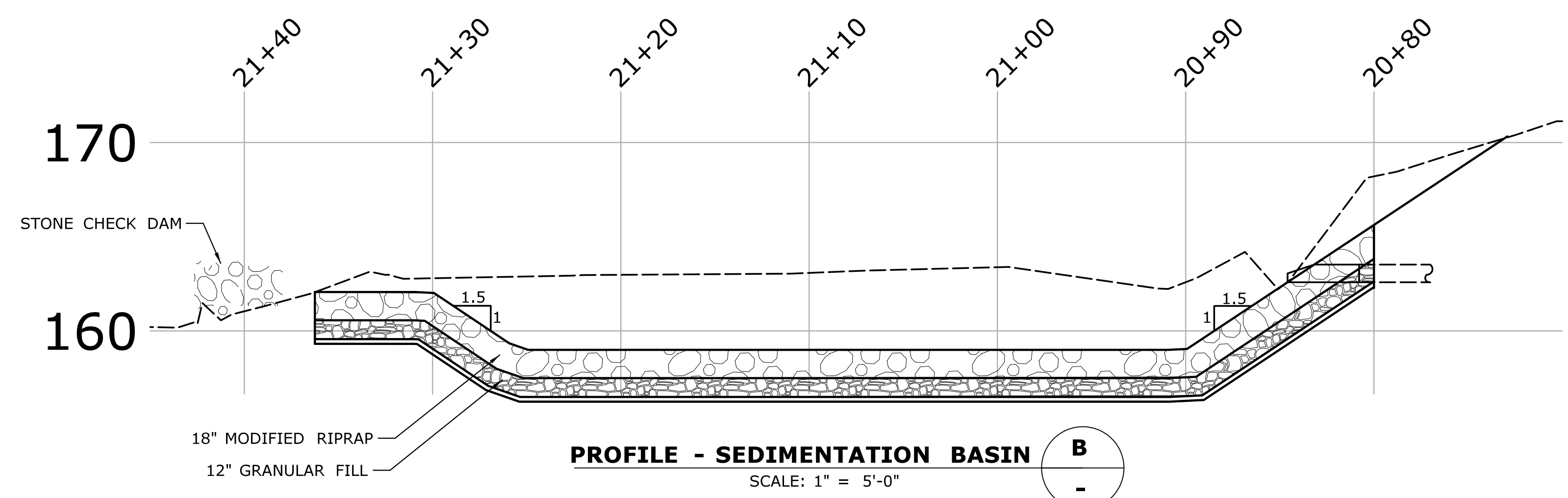
SITE 1 & 2 ENVIRONMENTAL PLAN

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

REV. DATE		REVISION DESCRIPTION		SHEET NO.		Plotted Date: 12/1/2014		
-	-	-	-	-	-	THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE AS NOTED	
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			
-	-	-	-	-	-			
STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		OFFICE OF ENGINEERING MATTHEW R. VAIL 12/1/2014		PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83		TOWN: TOWN OF MANCHESTER DRAWING TITLE: SITE 1 & 2 ENV. PERMIT PLANS		
PROJECT NO. 76-193 DRAWING NO. PER-02 SHEET NO.								



- GENERAL NOTES
1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
 2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
 3. EXCAVATION OF SEDIMENTATION BASIN TO BE COMPLETED DURING DRY CONDITIONS.



DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
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-	-	-	-	

DESIGNER/DRAFTER:	CHECKED BY:	SCALE AS NOTED
CZ	MV	

STATE OF CONNECTICUT	DEPARTMENT OF TRANSPORTATION
Filename: ...\\HW...PER_0076_0193_PER_03.dgn	

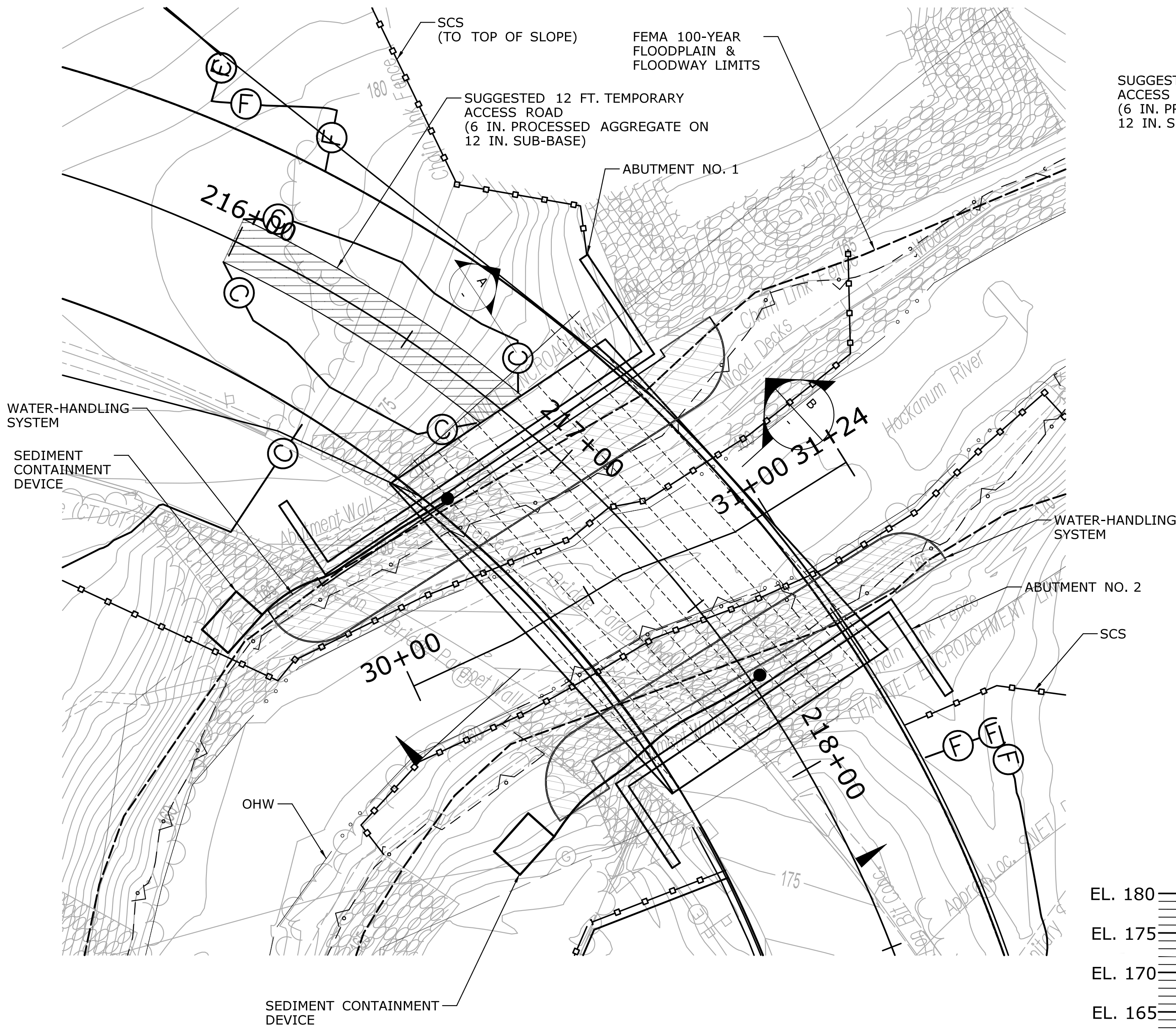
SIGNATURE/BLOCK:	APPROVED BY:
OFFICE OF ENGINEERING	MATTHEW R. VAIL
	12/1/2014

PROJECT TITLE:	TOWN:	PROJECT NO.
IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN OF MANCHESTER	76-193
		DRAWING NO. PER-03
		SHEET NO.

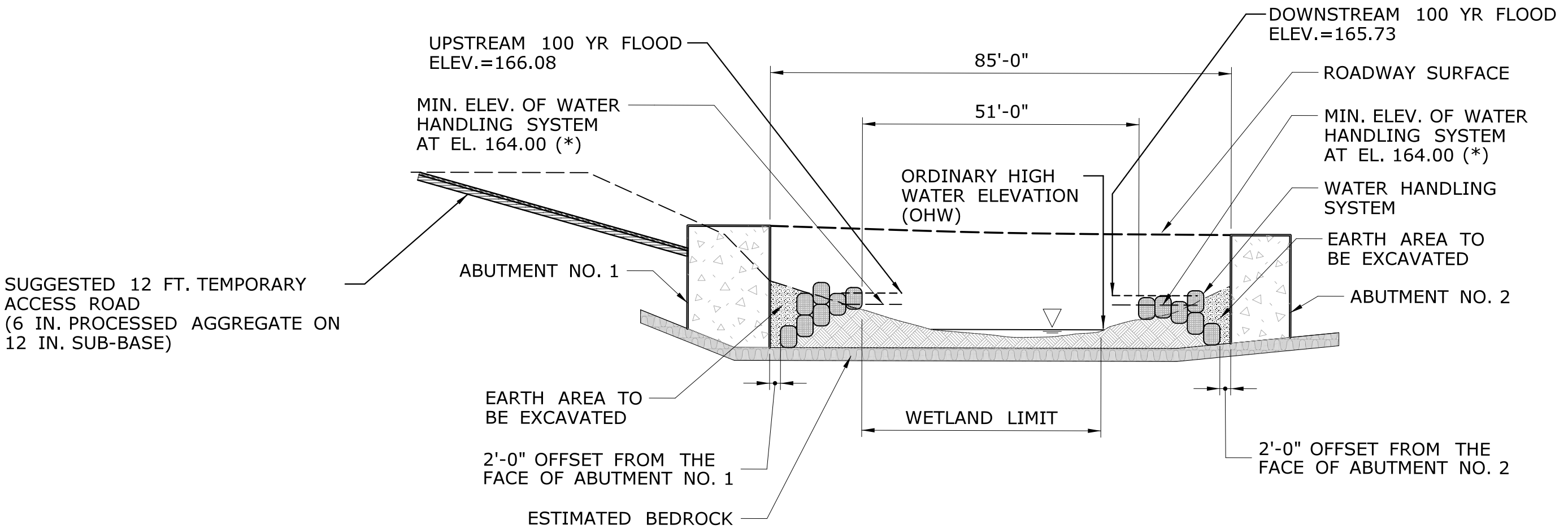
DRAWING TITLE:
SEDIMENT TRAP SITE 2 ENV. PERMIT PLANS

GENERAL NOTES

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2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
3. ALL FINAL GRADES ADJACENT TO BRIDGE ABUTMENTS MUST MATCH GRADES EXISTING PRIOR TO EXCAVATION. SEE GRADING DETAIL ON PER-05.



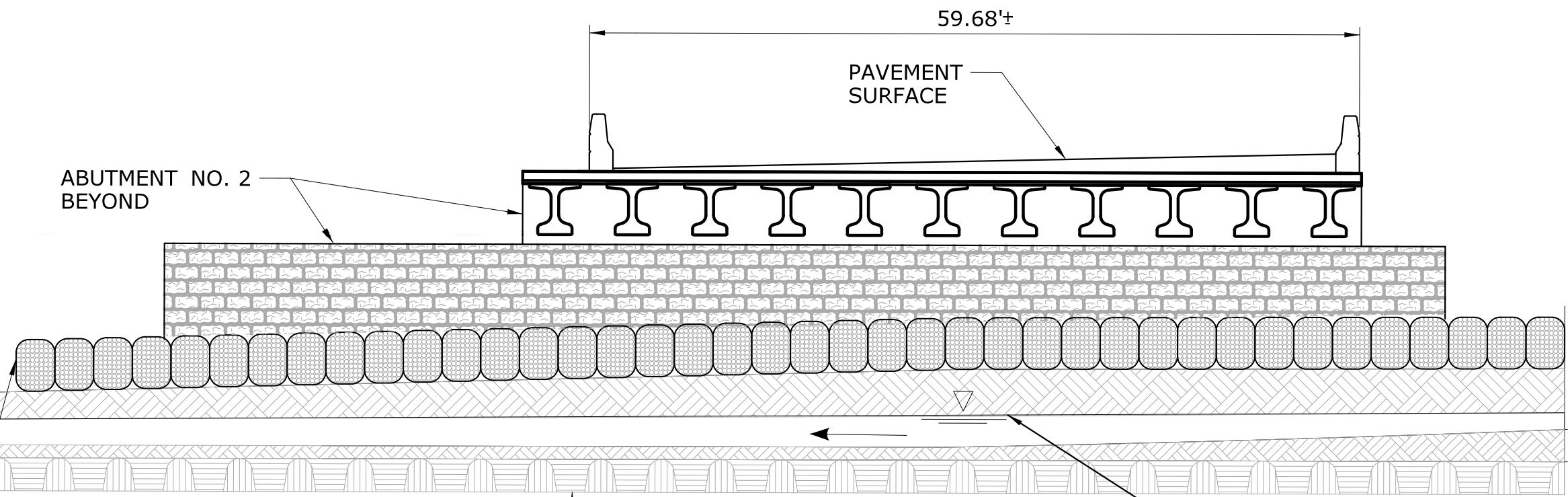
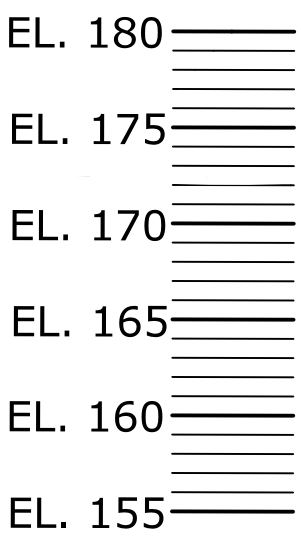
SITE 1



CROSS SECTION - BRIDGE CENTER

SCALE: 1" = 20'

Temporary Hydraulic Facilities Data Table	
Average Daily Flow	85 cfs
Average Spring Flow	164 cfs
2 - year Frequency Discharge	820 cfs
Temporary Design Discharge	1330 cfs
Temporary Design Frequency	5-year
Temporary Water Surface Elevation Upstream	163.6 ft
Temporary Water Surface Elevation Downstream	162.7 ft



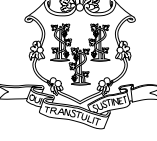

SECTION

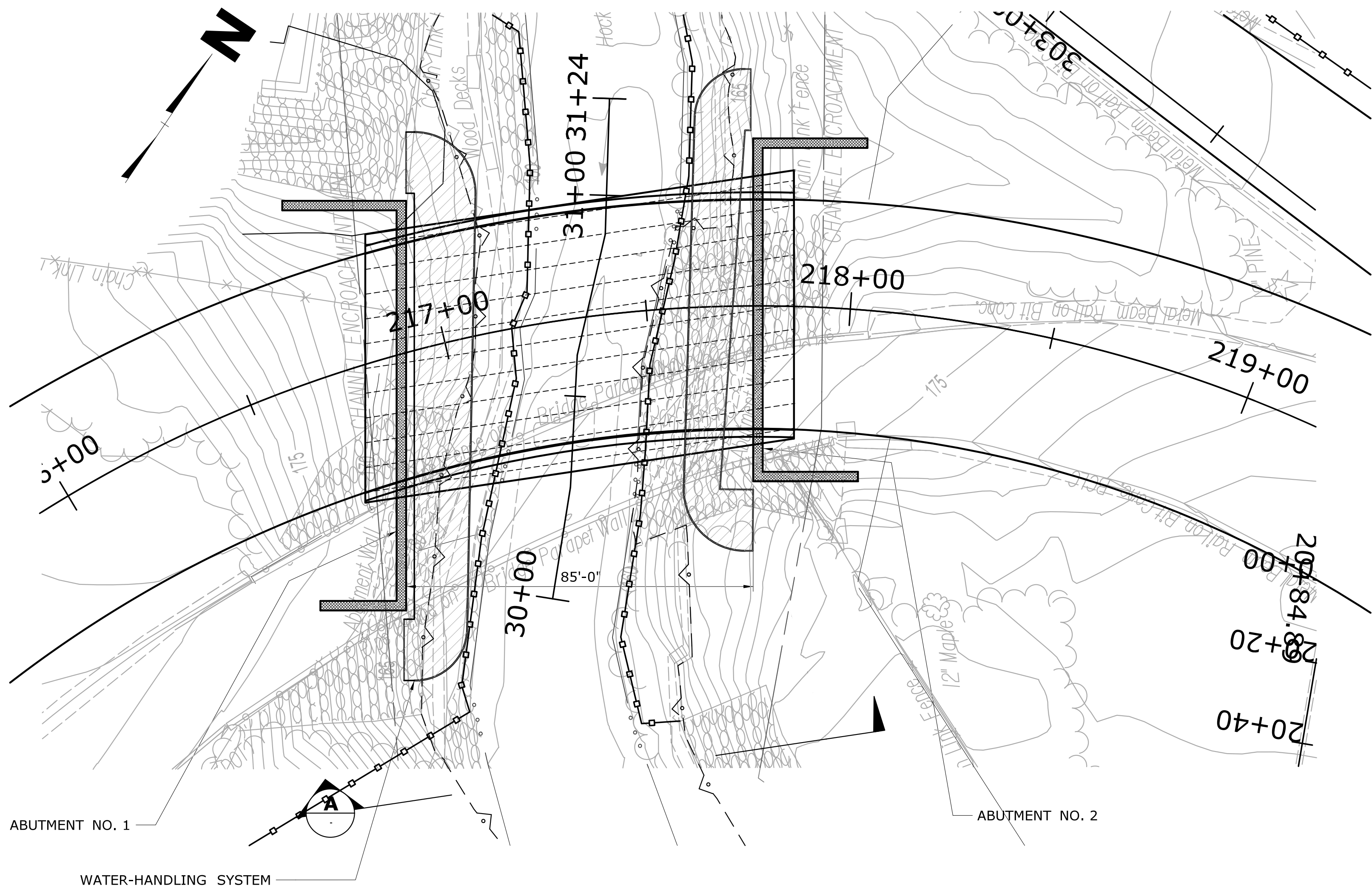
SCALE: 1" = 10'

NOTE

(*) REQUIRED FOR A 5-YEAR STORM EVENT

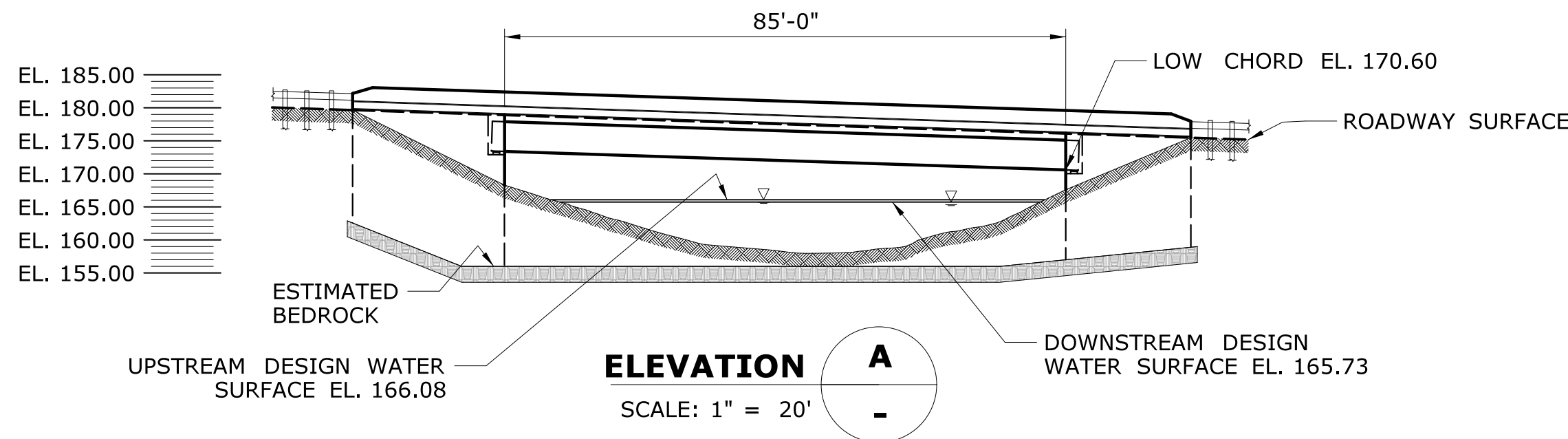
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

DESIGNER/DRAFTER: CZ	 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		SIGNATURE/ BLOCK: OFFICE OF ENGINEERING	APPROVED BY: MATTHEW R. VAIL 12/1/2014	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER	PROJECT NO. 76-193
CHECKED BY: MV							
SCALE AS NOTED	Filename: ...\\VHW_PER_0076_0193_PER_04.dgn						
REV. DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014				



GENERAL PLAN - BRIDGE NO. 05234

SCALE: 1" = 20'



ELEVATION

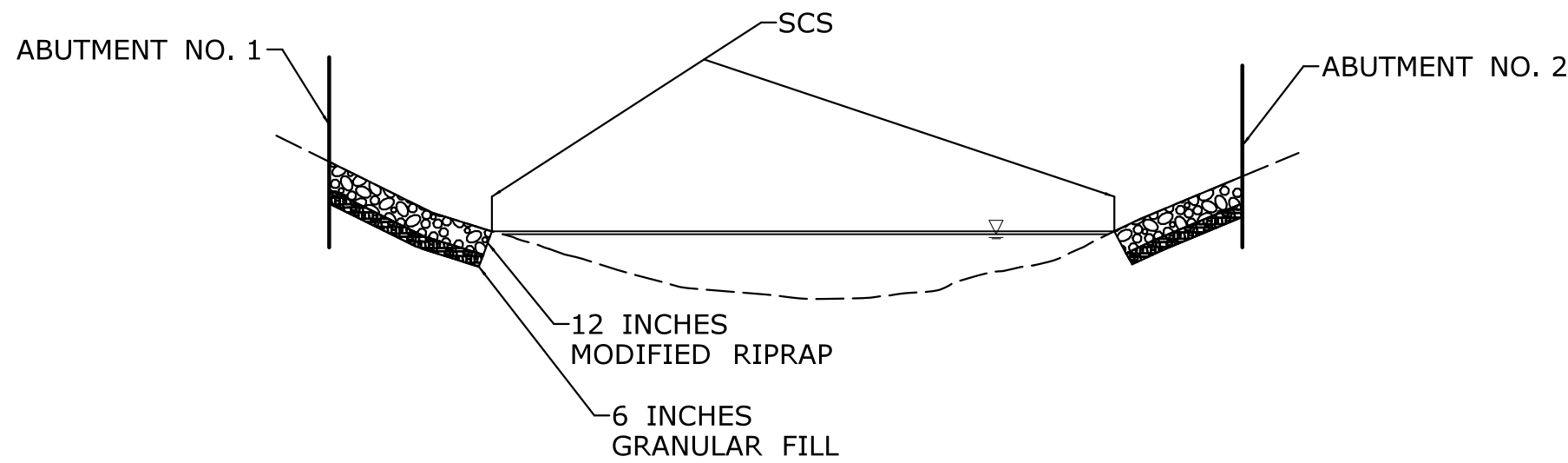
SCALE: 1" = 20'

*DESIGN FOR 100 YEAR FLOOD ELEVATION

- GENERAL NOTES**
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 2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.
 3. ALL EXCAVATION, BRIDGE CONSTRUCTION, AND ROADWAY CONSTRUCTION TO BE COMPLETED UTILIZING ONE WATER HANDLING STAGE.
 4. CONTRACTOR RESPONSIBLE FOR ENSURING CONSTRUCTION DEBRIS DOES NOT ENTER RIVER. MINIMUM ELEVATION OF DEBRIS CONTAINMENT SYSTEM IS 166.08 FT.

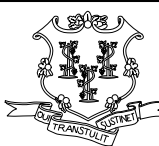
RECOMMENDED CONSTRUCTION STAGING SEQUENCE

1. INSTALL SEDIMENTATION CONTROL SYSTEM AND SAND BAG WATER HANDLING SYSTEM. MINIMUM SAND BAG ELEVATION AND MAXIMUM FOOTPRINT TO BE AS SHOWN IN WATER HANDLING DETAILS.
2. CONSTRUCT NORTHERN PORTION OF BRIDGE.
3. SHIFT TRAFFIC TO NORTHERN PORTION OF BRIDGE AND DEMOLISH EXISTING BRIDGE.
4. CONSTRUCT SOUTHERN PORTION OF BRIDGE. STAGES 2, 3, AND 4 SHALL BE COMPLETED WITHIN THE WATER HANDLING SYSTEM ESTABLISHED IN STAGE 1.
5. REMOVE WATER HANDLING SYSTEM AND COMPLETE FINAL GRADING.



NOTE:
ALL FINAL GRADES MUST MATCH EXISTING GRADES
PRIOR TO EXCAVATION

FINAL GRADING DETAIL
NOT TO SCALE

				DESIGNER/DRAFTER: CZ		 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: MATTHEW R. VAIL 12/1/2014	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: MANCHESTER	PROJECT NO. 76-193					
				CHECKED BY: MV											
				SCALE AS NOTED											
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 12/1/2014		Filename: ...\\HW...PER_0076_0193_PER_05.dgn									
								DRAWING TITLE: SITE 1 FINAL ENV. PERMIT PLANS		DRAWING NO. PER-05					
										SHEET NO.					

1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
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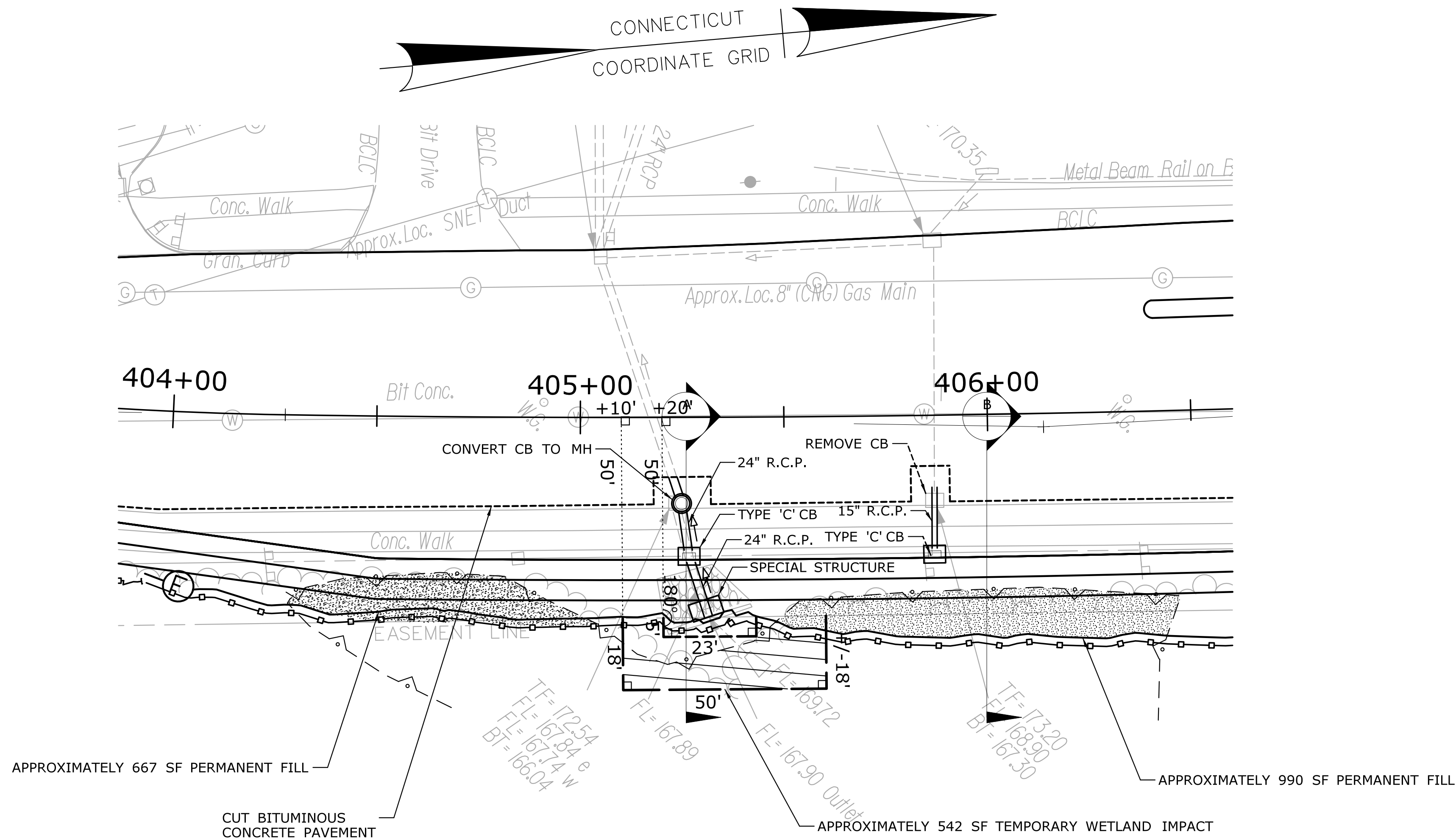
 SEDIMENTATION CONTROL SYSTEM (SCS)

 TEMPORARY WETLAND IMPACT AREA

 PERMANENT WETLAND IMPACT AREA

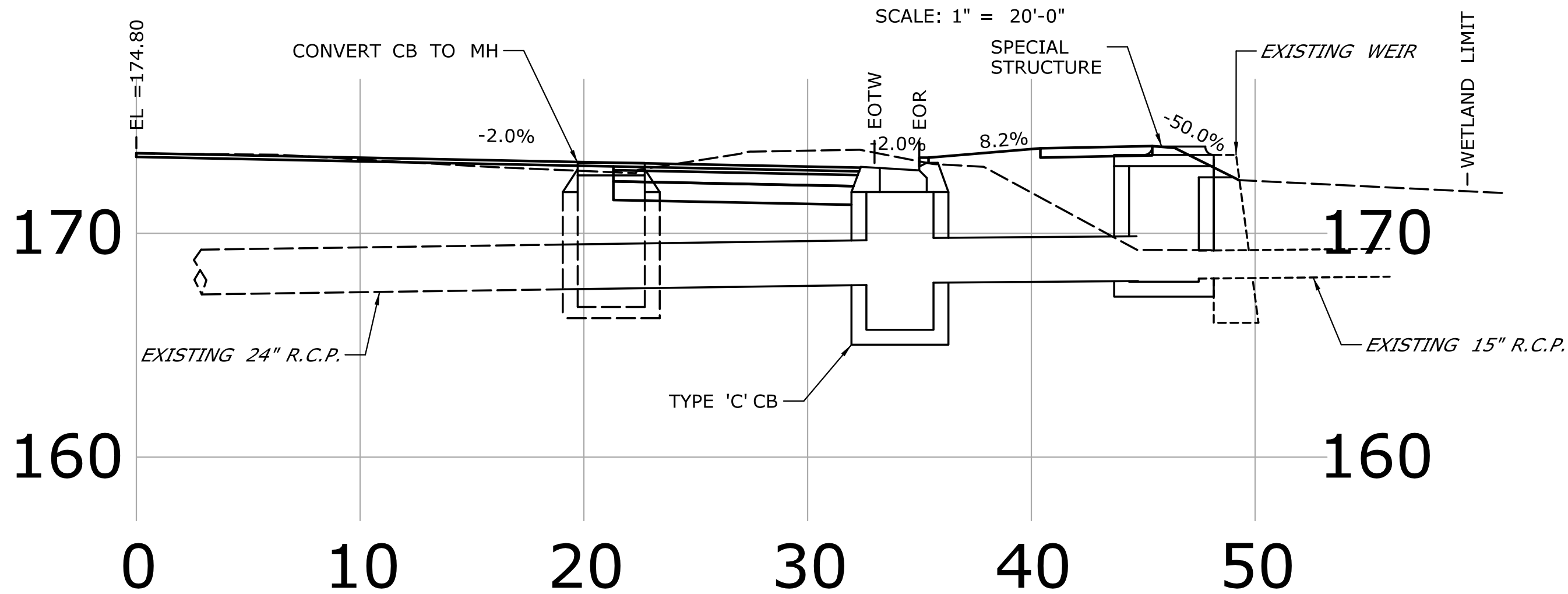
DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK						
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER	

[illegible]



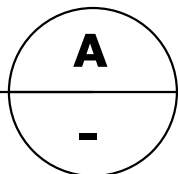
PLAN VIEW - SITE 3

SCALE: 1" = 20'-0"

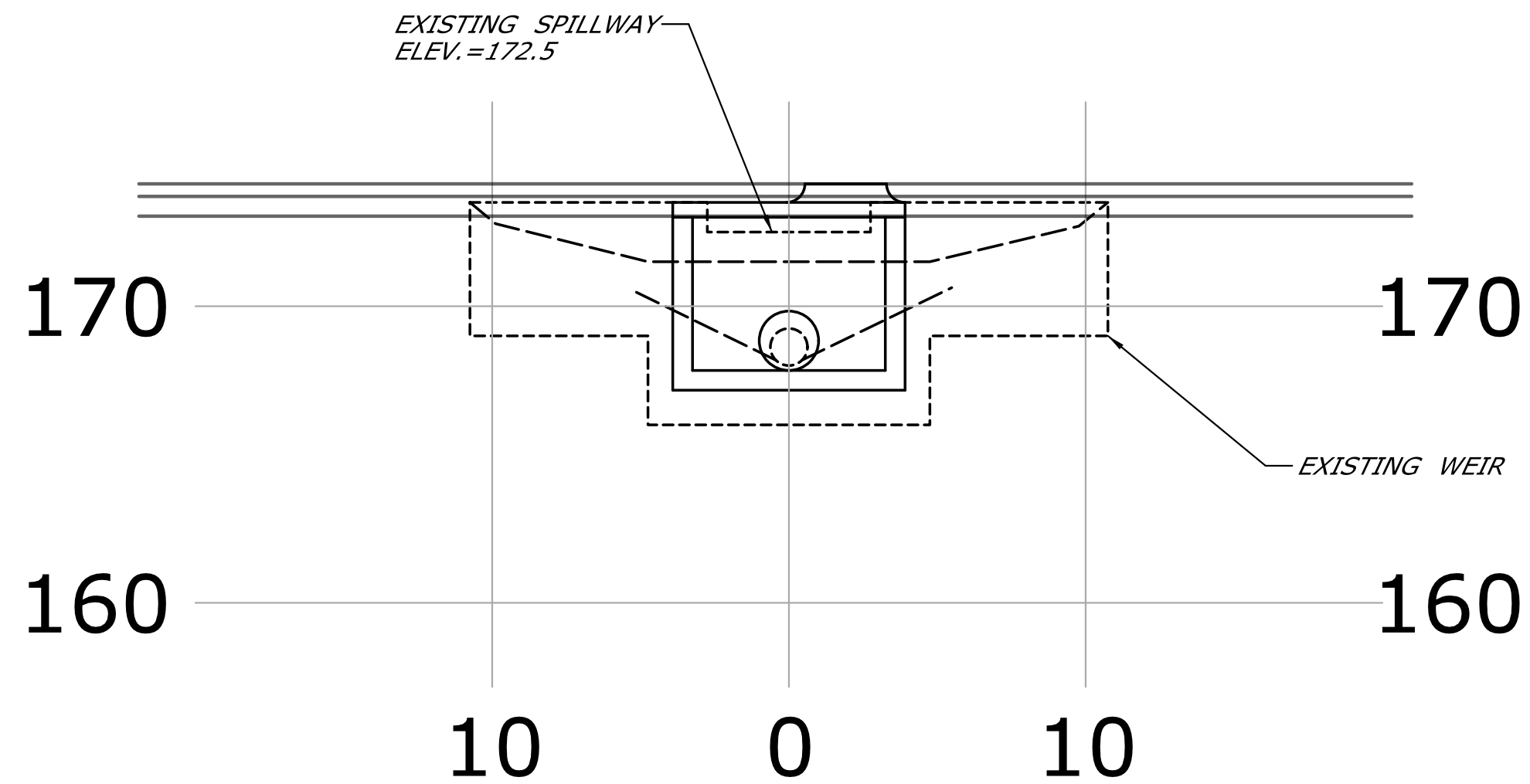


HALF SECTION - STA. 405+34

SCALE: 1" = 5'-0"

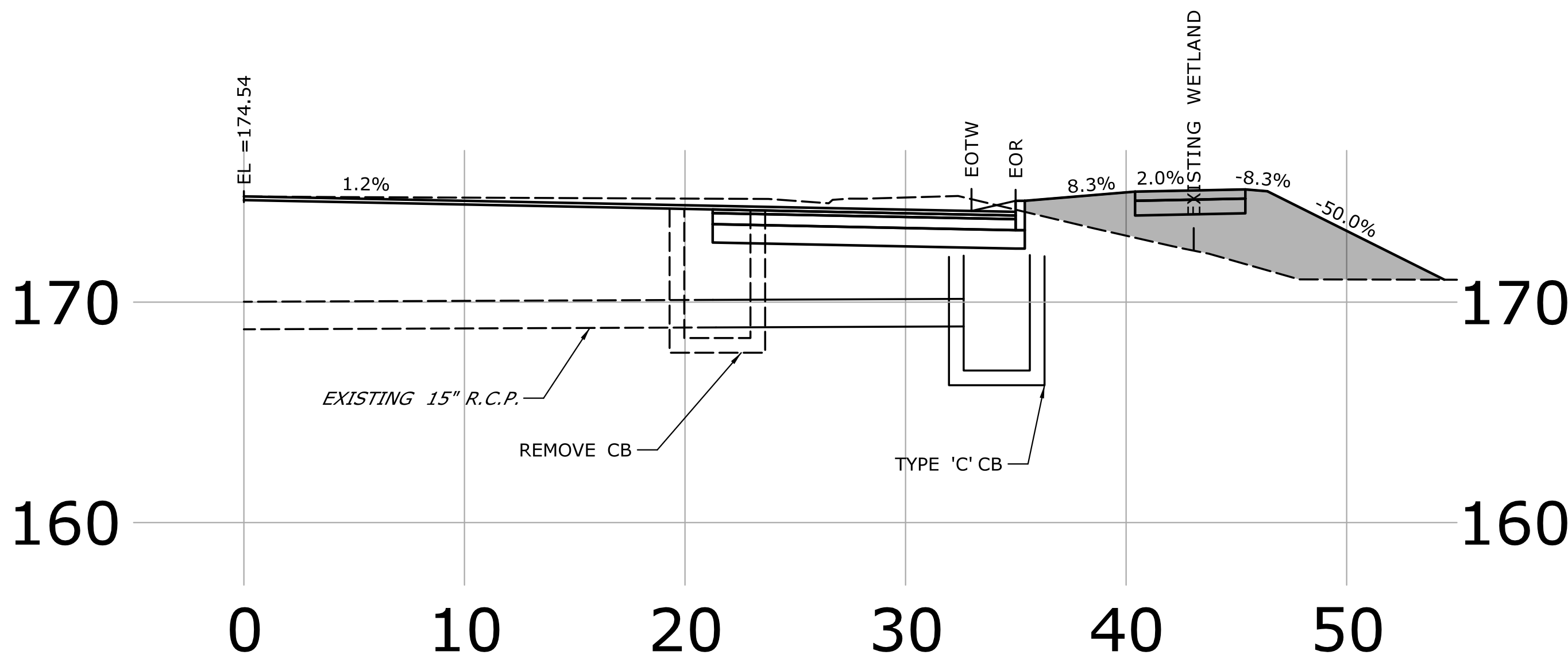


- GENERAL NOTES
1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
 2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.



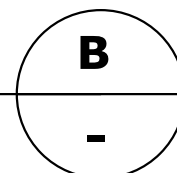
ELEVATION - SPILLWAY OUTLET STRUCTURE

SCALE: 1" = 5'-0"



HALF SECTION - STA. 406+00

SCALE: 1" = 5'-0"



DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK					
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER

-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 12/1/2014

DESIGNER/DRAFTER:
CZ
CHECKED BY:
MV
SCALE AS NOTED

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...VHW_PER_0076_0193_PER_07.dgn

SIGNATURE/
BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:
MATTHEW R. VAIL **12/1/2014**

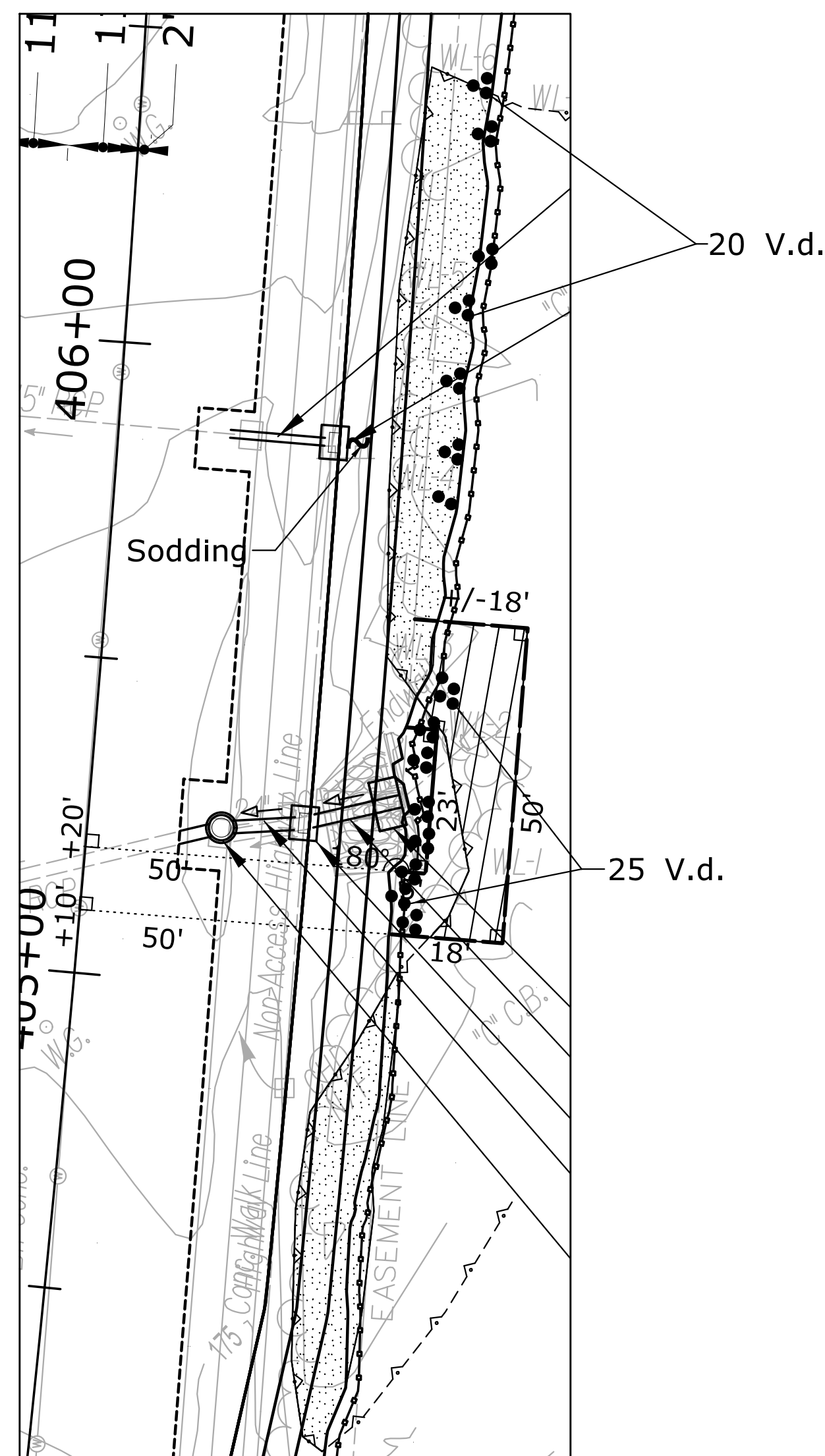
PROJECT TITLE:
**IMPROVEMENTS ON I-84 EXIT 63
OFF-RAMP AND INTERSECTION
OF ROUTES 30 & 83**

TOWN:
TOWN OF MANCHESTER
DRAWING TITLE:
**RTE. 83 FILL EMBANKMENT
ENV. PERMIT PLANS**

PROJECT NO.
76-193
DRAWING NO.
PER-07
SHEET NO.

GENERAL NOTES

1. THESE PLANS ARE FOR ENVIRONMENTAL PERMITTING PURPOSES. THE INTENT IS TO SHOW PROCEDURES, DIMENSIONS, AND PROCESSES FOR THE PROTECTION OF ENVIRONMENTAL AREAS. FOR ALL OTHER CONSTRUCTION INFORMATION, INCLUDING INFORMATION RELATED TO PAYMENT, REFER TO THE CONSTRUCTION PLANS, STANDARD DRAWINGS, AND SPECIFICATIONS. IF THERE ARE CONFLICTS BETWEEN THESE PERMIT PLANS AND THE CONSTRUCTION PLANS IN THE REGULATED AREAS, THE PERMIT PLANS SHALL GOVERN.
2. THE CONTRACTOR SHALL NOT DISTURB ANY REGULATED AREA OUTSIDE OF THE LIMITS OF THE NUMBERED WETLAND SITES SHOWN IN THE PLANS.



Site 3

PLANT LIST					
KEY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	COMMENTS
V.d	<i>Viburnum dentatum</i>	Arrowwood Viburnum	18"-24" Ht. B.B.	4' On Center	

*QUANTITY OF PLANTS SUBJECT TO CHANGE DUE TO FIELD CONDITIONS

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION PLAN REVISION BLOCK						
WETLAND SITE NO.	APPLICANT NAME	ORIGINAL SUBMISSION DATE	REVISION DATE	REVISION DESCRIPTION	REVISION NUMBER	

[illegible]

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist

The following is a checklist of requirements that need to be completed, included and submitted as part of the Engineering Report. Please complete this checklist by identifying where each requirement listed is addressed in the Engineering Report (report title and page numbers). If an item is not applicable, place "NA" in the box. Attach the completed checklist as the cover sheet to engineering reports, as applicable, which fully describe the design of the proposed facilities or other actions and the hydraulic and hydrologic effects thereof. The application instructions (DEP-IWRD-INST-100) should be consulted for a complete description of each item listed. This checklist is required to be signed and sealed by a professional engineer licensed in the State of Connecticut.

Stormwater Management

Location of Item	Item Description
Hyd Rpt	Description of the design storm frequency intensity, volume and duration
Drainage Rpt	Watershed maps, existing and proposed
Drainage Rpt	Computations for Tc
N/A	Imperviousness calculations
N/A	NRCS runoff curve numbers, volumetric runoff coefficients
N/A	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): <ul style="list-style-type: none">• Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm)• Conveyance Protection: 10-year frequency• Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency• Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
N/A	Hydrograph routing calculations
Hyd Rpt	Description, schematics, and calculations for drainage and stormwater management systems, bridges and culverts
Drainage Rpt	Infiltration rates
Hyd Rpt	Documentation of sources
Hyd Rpt	Computer disk containing input and output data and the associated program for all computer models used in the analyses
N/A	Hard copy of input and output data including input/output tables
N/A	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Flood Plain Assessment

Location of Item	Item Description
N/A	Description or simulation of existing and proposed conditions upstream and downstream of the proposed activity
N/A	(For SCEL applications only) A determination of the effect of the proposed activity on flooding and flood hazards together with an equivalent encroachment on the opposite bank for the flood event establishing the encroachment lines
N/A	For any bridge or culvert placement or replacement with a drainage area of 100 acres or more, plan sheets showing the existing and proposed inundation area for the 2, 10, 25, 50, and 100 year discharges, carried to convergence
N/A	A description and analysis of the floodplain modifications required to restore any flood conveyance and flood storage capacity
N/A	Demonstration that backwater from the proposed activity will not impact an existing dam, dike, or similar structure
N/A	Backup data and complete hydraulic analysis for proposed modifications to the floodplain including location plan and plot for sections, profile sheet, summary sheet

Dams, Dikes, Diversion Channels, Similar Structures

Location of Item	Item Description
N/A	Primary and emergency spillway and outlet structure erosion protection
N/A	Dam breach analysis
N/A	Geotechnical evaluation
N/A	Construction Specifications for foundation preparation, embankment material, outlet structure, and construction inspection

Soil Erosion and Sediment Control Plan

Location of Item	Item Description
	Narrative
	Drawings
	Details
	Calculations for Engineered Measures

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

This certification is based on my review of the Engineering Report.

I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Thomas J. Maziarz

Signature of Applicant

12-3-2014

Date

Thomas J. Maziarz

Name of Applicant (print or type)

Bureau Chief-Policy & Planning

Title (if applicable)

Matthew R. Vail

Signature of Professional Engineer

Dec 2 2014

Date

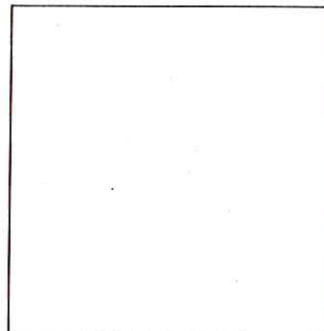
Matthew R. Vail

Name of Professional Engineer (print or type)

Preparer - Conn. DOT

P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)



Attachment H: Engineering Documentation

Part 2: Hydrologic and Hydraulic Consistency Worksheet

Inland Water Resources Division Permit Activities

This worksheet has four sections; only complete the section(s) applicable to the proposed project. Where a question requires a "Yes" or "No" answer, select the appropriate response and explain your response, if required, in the space provided.

Section I: Floodplain Management *(if the proposed project involves a structure, obstruction, encroachment or work in a watercourse, floodplain, or coastal high hazard area)*

Section II: Stormwater Management *(if the proposed project involves stormwater drainage or stormwater runoff)*

Sections III: State Grants and Loans and Section IV: Disposal of State Land *(only if the applicant is a state agency seeking flood management certification approval for state grants and loans or disposal of state land)*

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Definitions of terms used in these worksheets are found in Section 25-68b of the Connecticut General Statutes and Section 25-68h-1 of the Regulations of Connecticut State Agencies and in the National Flood Insurance Program Regulations (44 CFR, Chapter 1, Subchapter B, Part 59.1).

Section I: Floodplain Management

Section I: Floodplain Management

Name of Applicant: **CT Department of Transportation**

Name of Proposed Project: **76-193 Improvements on I-84 EB Exit 63 On/Off Ramp**

1. General Criteria

- a. *Critical Activity* - Does the proposed project involve the treatment, storage and disposal of hazardous waste or the siting of hospitals, housing for the elderly, schools or residences, in the 0.2 per cent [500 year] floodplain? ☐ Yes ☒ No

If yes, the base flood for the critical activity shall have a recurrence interval equal to the 500 year flood event; if no, the base flood for the activity shall have a recurrence interval equal to the 100 year flood event.

- b. *Nonintensive Floodplain Uses* - Will the proposed project promote development in floodplains or will utilities servicing the project be located so as to enable floodplain development?

☐ Yes ☒ No

Explain:

- c. *National Flood Insurance Program (NFIP)* - Will the proposed project be located within an area of special flood hazard designated by the Federal Emergency Management Agency (FEMA)?

☒ Yes ☐ No If yes, list the FEMA flood zone(s):

FEMA Zone AE

Does the proposed project meet the NFIP minimum standards established in 44 CFR, Chapter 1, Subchapter B, Part 60.3, floodplain management criteria for flood-prone areas?

☒ Yes ☐ No

- d. *Municipal Regulations* - Has the municipality in which the proposed project is to be located adopted floodplain regulations containing requirements that are more restrictive than the NFIP floodplain management criteria for flood-prone areas? ☐ Yes ☒ No

If yes, describe the more restrictive requirements:

Does the proposed project comply with the more restrictive standards of the municipality?

☐ Yes ☐ No

Section I: Floodplain Management (continued)

2. Flooding and Flood Hazards

- a. *Flooding* - Will the proposed project pose any hazard to human life, health or property in the event of a base flood? ☐ Yes ☒ No

If yes, explain:

- b. *Flood Velocities* - Will the proposed project cause an increase in flow velocity or depth during the base flood discharge? ☐ Yes ☒ No

If yes, the increase in velocity is: fps
and/or the increase in depth is: ft.

Will such increase in velocity or depth cause channel erosion or pose any hazard to human life, health or property? ☐ Yes ☒ No

Explain:

- c. *Flood Storage* - Will the proposed project affect the flood storage capacity or flood control value of the floodplain? ☐ Yes ☒ No

If yes, describe the effects:

- d. *Degrading or Aggrading Stream Beds* - Is the streambed currently degrading or aggrading?

☐ Degrading ☐ Aggrading ☒ Neither

Has the project design addressed degrading or aggrading streambed conditions?

☐ Yes ☐ No

- e. *Ice Jams* - Is the watercourse prone to ice jams or floods due to ice? ☐ Yes ☒ No

Has the project design considered ice jams or floods due to ice? ☐ Yes ☒ No

Section I: Floodplain Management (continued)

- f. *Storage of Materials & Equipment* - Will the construction or use of the proposed project involve the storage of materials below the 500 year flood elevation that are buoyant, hazardous, flammable, explosive, soluble, expansive or radioactive, or the storage of any other materials which could be injurious to human, animal or plant life in the event of a flood?

☐ Yes ☒ No

If yes, describe the materials and how such materials will be protected from flood damage, secured or removed from the floodplain to prevent pollution and hazards to life and property.

Storage of materials that could be injurious to human health or the environment in the event of flooding is prohibited below the elevation of the 500 year flood. Other material or equipment may be stored below the 500 year flood elevation provided that such material or equipment is not subject to major damage by floods, and provided that such material or equipment is firmly anchored, restrained or enclosed to prevent it from floating away or that such material or equipment can be removed prior to flooding.

- g. *Floodwater Loads* - Will structures, facilities and stored materials be anchored or otherwise designed to prevent floatation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy? ☒ Yes ☐ No

3. Standards for Structures in Floodplains or Coastal High Hazard Areas

Does the proposed project involve a new or substantially improved structure or facility located within a floodplain or coastal high hazard area? ☐ Yes ☒ No

If yes, complete this subsection; if no, skip to subsection 4 (*Topography Changes within Floodplain*).

- a. *Structures in Coastal High Hazard Areas* - Will the structure or facility be located within an NFIP coastal high hazard area? ☐ Yes ☐ No

If no, skip to paragraph 3(b); if yes:

1. Will the structure or facility be located landward of the reach of mean high tide?
☐ Yes ☐ No
2. Will a new structure or facility be located on an undeveloped coastal barrier beach designated by FEMA? ☐ Yes ☐ No
3. If the structure or facility is/will be located within a coastal high hazard area, the structure or facility must be elevated on pilings or columns so that the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to at least one foot above the base flood level and the pile or column foundation and structure attached thereto must be anchored to resist floatation, collapse and lateral movement due to the effects of wind, velocity waters, hurricane wave wash, and base flood water loads acting simultaneously on all building components.

Does the proposed structure or facility meet these standards? ☐ Yes ☐ No

The base flood elevation is: ft. (Datum:)

The elevation of the lowest horizontal structural member is: ft. (Datum:)

Section I: Floodplain Management (continued)

4. Will the space below the lowest floor be either free of obstruction or constructed with non-supporting breakaway walls? ☐ Yes ☐ No

5. Will fill be used for structural support of any buildings within coastal high hazard areas?

☐ Yes ☐ No

b. *Structures in Floodplain Areas* - Are the structures residential or nonresidential?

☐ Residential ☐ Nonresidential If *nonresidential*, skip to paragraph 3(d) below.

c. *Residential Structures* - If the structure or facility is for human habitation will the lowest floor of such structure or facility, including its basement, be elevated one foot above the level of the 500 year flood?

☐ Yes ☐ No

The 500 year flood elevation is: ft. (Datum:)

The elevation of the lowest floor, including basement, is: ft. (Datum:)

d. *Non-residential Structures* - If the structure or facility is not intended for residential uses, will the lowest floor of such structure or facility, including its basement, be elevated to or above the 100 year flood height or be floodproofed to that height, or in the case of a critical activity, the 500 year flood height?

☐ Yes ☐ No

If yes, the structure will be: ☐ Elevated ☐ Floodproofed

The base flood elevation is: ft. (Datum:)

The elevation of the lowest floor, including basement, is: ft. (Datum:)

The structure is floodproofed to: ft. (Datum:)

Note: for insurance purposes nonresidential structures must be floodproofed to at least one foot above the base flood elevation. DEP strongly encourages that the height of floodproofing incorporate one foot of freeboard.

e. *Utilities* - Will service facilities such as electrical, heating, ventilation, plumbing, and air conditioning equipment be constructed at or above the elevation of the base flood or floodproofed with a passive system? ☐ Yes ☐ No

f. *Water Supply Systems* - Does the proposed project include a new or replacement water supply system?

☐ Yes ☐ No

If yes, is the water supply system designed to prevent floodwaters from entering and contaminating the system during the base flood? ☐ Yes ☐ No

g. *Sanitary Sewage Systems* - Does the proposed project include a new or replacement sanitary sewage or collection system? ☐ Yes ☐ No

If yes, is the sanitary sewage system designed to minimize or eliminate the infiltration of flood waters into the systems and discharges from the systems into flood waters during the base flood?

☐ Yes ☐ No

h. *Foundation Drains* - Are foundation drains of buildings designed to prevent backflow from the 100 year frequency flood into the building?

☐ Yes ☐ No ☐ No foundation drains

Section I: Floodplain Management (continued)

4. Activity within Floodplain

Does the proposed project involve activity in a floodplain including but not limited to filling, dumping, construction, excavating, or grading?

☒ Yes ☐ No If no, skip to subsection 5 (**Alterations of Watercourses**).

If yes, does the proposed project include encroachments, including fill, new construction, substantial improvements, or other development within a NFIP adopted regulatory floodway?

☐ Yes ☒ No If yes, skip to paragraph 4(b) below.

- a. **No Regulatory Floodway** - The NFIP requires that until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point. (If no regulatory floodway has been adopted, project impacts may be evaluated by considering an equivalent conveyance loss on the opposite side of the river from the proposed project.)

Is the proposed project consistent with this requirement? ☐ Yes ☐ No

- b. **Floodway Encroachments** - Will the proposed encroachment into the floodway result in any increase in flood levels during either the 100 year or 10 year discharges?

100 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☐ No

If yes, has the applicant received approval of such increase in accordance with 44 CFR, Chapter 1, Subchapter B, Part 65.12? ☐ Yes ☐ No

10 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☐ No

- c. **Coastal Areas** - Flood hazard potential in coastal areas shall be evaluated considering surface profiles of the combined occurrence of tides, storm surges, and peak runoff. The starting water surface elevation for the base flood in watersheds with time of concentrations of over 6 hours shall be the 10 year frequency tidal surge level.

If the proposed project is in a coastal area, have the hydraulic analyses incorporated these criteria?

☐ Yes ☐ No ☐ Not in Coastal Area

5. Alterations of Watercourses

Does the proposed project include the construction or alteration to a natural perennial watercourse or man-made channel?

☐ Yes ☒ No If no, skip to subsection 6 (**Culverts and Bridges**); if yes, complete the following subsection:

- a. **Topography Change** - Is the watercourse or channel located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☐ Yes ☐ No
- b. **Hydraulic Capacity** - Does the channel have a minimum flow capacity of a flood equal to at least the 25 year frequency flood? ☐ Yes ☐ No

The channel capacity is designed for the: year flood.

Does the channel have an inner channel with a capacity of a 2 year frequency flood? ☐ Yes ☐ No

Section I: Floodplain Management (continued)

- c. *Aquatic Habitat* - Channel alterations should be designed to create aquatic habitats suitable for fisheries, including suitable habitat for maintaining fish populations and to enable fish passage, and to maintain or improve water quality, aesthetics, and recreation.

Has the applicant had any pre-application meetings or correspondence with DEP Fisheries?

☒ Yes ☐ No

Check each of the following criteria that have been incorporated into the project design:

- ☐ 1. artificial channel linings have been avoided;
- ☐ 2. the channel will encourage ecological productivity and diversity;
- ☐ 3. the channel and its banks will be compatible with their surroundings;
- ☐ 4. the channel will vary in its width, depth, invert elevations, and side slopes to provide diverse aquatic habitat;
- ☐ 5. straightening existing channels and thereby decreasing their length has been avoided;
- ☒ 6. the channel will not create barriers to upstream and downstream fish passage;
- ☐ 7. the channel will contain pools and riffles and a low flow channel to concentrate seasonal low water flows;
- ☐ 8. the channel will contain flow deflectors, boulders and low check dams to enhance aquatic habitat;
- ☐ 9. stream bank vegetation will be preserved where feasible and disturbed stream bank areas will be replanted with suitable vegetation;
- ☐ 10. clean natural stream bed materials of a suitable size will be incorporated in the new channel; and
- ☐ 11. construction of the proposed project will be scheduled to minimize conflicts with spawning, stocking, and recreational fishing seasons.

Describe how the above aquatic habitat design criteria have been incorporated into the project design:

At the request of DEEP Inland Fisheries, a rootwad will be placed on the northern side of the Hockanum River approximately 100 feet downstream of the new abutment for the Exit 63 Off-Ramp Bridge.

Section I: Floodplain Management (continued)

6. Culverts and Bridges

Does the proposed project involve the repair or new construction of a culvert or bridge?

☒ Yes ☐ No If no, go to subsection 7 (*Temporary Hydraulic Facilities*).

If yes, complete this subsection:

- a. *Fish Passage* - Does the culvert design allow for the passage of fish? ☒ Yes ☐ No

If yes, describe the specific design provisions for fish passage:

At the request of DEEP Inland Fisheries, a rootwad will be placed on the northern side of the Hockanum River approximately 100 feet downstream of the new abutment for the Exit 63 Off-Ramp Bridge. The proposed structure spans the 100-year FEMA Floodplain limits and the Floodway.

- b. *Depressed Structural Floors* - Is the rigid structural floor of the culvert or bridge depressed below the normal stream bed to allow a natural stream bed to form over the floor?

☐ Yes ☐ No ☒ No rigid structural floor

- c. *Multiple Openings* - The use of a single large culvert or bridge opening is preferred over the use of multiple small openings. Has the design minimized the use of multiple small openings?

☒ Yes ☐ No

If no, explain:

The proposed structure spans the FEMA 100-yr floodplain and floodway

- d. *Sag Vertical Curves* - Does the design utilize solid parapet walls in the sag part of a vertical curve?

☐ Yes ☐ No ☒ Not located in a sag vertical curve

- e. *Debris Blockage* - Is the culvert or bridge prone to blockage by debris? ☐ Yes ☒ No

If yes, has the project design incorporated measures to minimize the potential for debris blockage?

☐ Yes ☐ No

- f. *Topography Change* - Is the culvert or bridge located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☐ Yes ☒ No

Section I: Floodplain Management (continued)

- g. *State Highways* - Does the watercourse pass under a state roadway?

☒ Yes ☐ No If no, skip to paragraph 6(g)(2).

If yes, culverts and bridges for state highways shall be designed in accordance with the Connecticut Department of Transportation (DOT) Drainage Manual and all applicants should refer to it for specific design criteria. In general, however, the Drainage Manual requires the following:

(Place a check mark for all applicable criteria utilized)

☐ *Minor Structures* - Minor structures have a drainage area of less than one square mile in which there is no established watercourse. They shall be designed to pass the 25 year frequency discharge.

☐ *Small Structures* - Small structures have a drainage area of less than one square mile in which there is an established watercourse. They shall be designed to pass the 50 year frequency discharge.

☐ *Intermediate Structures* - Intermediate structures have a drainage area greater than one square mile and less than 10 square miles. They shall be designed to pass the 100 year frequency discharge with reasonable underclearance.

☒ *Large Structures* - Large structures have a drainage area greater than 10 square miles and less than 1000 square miles. They shall be designed to pass the 100 year frequency discharge with an underclearance not less than two feet.

☐ *Monumental Structures* - Monumental structures have a drainage area greater than 1000 square miles. They shall be designed to meet the requirements of the Connecticut Department of Environmental Protection, U.S. Army Corps of Engineers, and the U.S. Coast Guard.

☐ *Tidal Structures* - Tidal structures are subject to tidal action and shall be classified as minor, small, intermediate, etc. depending on their drainage area. These structures shall be designed in accordance with the previously listed *classifications*. However if the highway is subject to frequent tidal flooding, the design storm may be made consistent with the frequency of flooding by tidal action. The proposed culvert or bridge is classified as:

☐ Tidal, minor

☐ Tidal, small

☐ Tidal, intermediate

☐ Tidal, large

☐ Tidal, monumental

1. Has the structure been designed in accordance with the criteria established in the DOT Drainage Manual? ☒ Yes ☐ No

If no, describe the lower design standards and the reasons for not complying with the DOT Drainage Manual:

Section I: Floodplain Management (continued)

2. Will the proposed culvert or bridge increase upstream water surface elevations in the event of a base flood above that which would have been obtained in the natural channel if the highway embankment were not constructed? ☐ Yes ☒ No

If yes, is the increase in elevation more than one foot? Describe:

3. Will the proposed culvert or bridge be designed so that flooding during the design discharge does not endanger the roadway or cause damage to upstream developed property? (NOTE: The design discharge for culverts and bridges on state highways should be that which was determined by FEMA. If the applicant judges that the FEMA discharge is inappropriate, the project should be analyzed for both the applicant's computed flow and the FEMA discharge. The project, however, must still meet the standards of the NFIP.) ☒ Yes ☐ No

Explain:

The proposed structure spans the FEMA 100-yr floodplain and floodway

- h. *Local Roads & Driveways* - Local roads (not state highways) and driveways may be designed for flood frequencies and underclearances less stringent than those specified in the DOT Drainage Manual when (check all that have been incorporated into the project design):

- ☐ 1. the road is at or close to the floodplain grade
- ☐ 2. water surface elevations are not increased by more than one foot nor cause damage to upstream properties
- ☐ 3. provisions are made to barricade the road when overtopped
- ☐ 4. the road or driveway is posted as being subject to flooding
- ☐ 5. the road or driveway has low traffic volume
- ☐ 6. alternate routes are available

The culvert or bridge has been designed to pass the: year frequency discharge with an underclearance of: feet.

Utilizing the DOT Drainage Manual classifications listed under paragraph 6(g) above, the culvert or bridge is classified as a: structure.

Section I: Floodplain Management (continued)

- h. If the culvert or bridge is designed to standards lower than which is stipulated in the DOT Drainage Manual, list such standards and the reasons for the lower design standards:

- i. *Downstream Peak Flows* - Will the proposed culvert or bridge increase downstream peak flows by decreasing existing headwater depths during flooding events? ☐ Yes ☒ No

If yes, describe the selected design criteria and the impacts to downstream properties:

7. Temporary Hydraulic Facilities

Temporary hydraulic facilities include all channels, culverts or bridges which are required for haul roads, channel relocations, culvert installations, bridge construction, temporary roads, or detours. They are to be designed with the same care which is used for the primary facility.

If the proposed activity involves a temporary hydraulic facility(s), has such facility been designed in accordance with Chapter 6, Appendix F, "Temporary Hydraulic Facilities," of the DOT Drainage Manual?

☒ Yes ☐ No ☐ No temporary hydraulic facilities

If yes, the design flood frequency is the: 5 year flood.

Describe the temporary facilities:

Temporary water handling facilities will be used for the construction of the proposed bridge abutments adjacent to the Hockanum River. Large sandbags/flow diversion water handling structures will be placed along streambanks and into excavated areas beyond the streambank to reduce amount of water seepage through streambank into the excavated area. Some dewatering may be required. Large sandbags/flow diversion water handling structures will be placed up to the elevation of the 5-year frequency event.

Section II: Stormwater Management

Name of Applicant: **Connecticut Department of Transportation**

Name of Proposed Project: **76-193 - Improvements on I-84 EB Exit 63 On/Off-Ramp**

1. Stormwater Runoff

The proposed project will (check all that apply):

- ☒ Increase the area of impervious surfaces
- ☒ Increase runoff coefficients
- ☐ Alter existing drainage patterns
- ☐ Alter time of concentrations
- ☐ Change the timing of runoff in relation to adjacent watersheds

Will the proposed project impact downstream areas by increasing peak flow rates, the timing of runoff, or the volume of runoff? ☐ Yes ☒ No

If yes, describe the downstream impacts for the 2, 10 and 100 year frequency discharges:

An improved sedimentation trap, a new infiltration trench, and other Stormwater Treatment practices have decreased the peak flow rates throughout the project and will improve the overall water quality volume. The downstream impacts will improve for the 2,10 and 100 year frequency discharge due to the infiltration trench reducing the total flow that outlets directly into the Hockanum River and the sedimentation trap increasing the sediment removal at the drainage outlet. The infiltrated flow both at the infiltration trench and the sediment trap will filter through media before recharging ground water sources.

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2	N/A See selection criteria	N/A See selection criteria
10	44.5	47.2
100	N/A	N/A

The above peak discharges were computed utilizing the: **0.22** hour duration storm. This duration storm was selected because:

This discharge was computed using the Rational method and Manning's equation to have the longest Time of Concentration duration, which is required under the CTDOT Stormwater guidelines and the CTDOT Drainage Manual. Please note that the peak discharges are a sum-total figure from all 6 outlets for the project. There is no change in the number of outlets from pre-development to post-development.

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

The location of the infiltration trench, and sedimentation basin were strategically located to treat stormwater runoff prior to reaching the Hockanum River or any of its tributaries.

2. Stormwater Detention Facilities

Does the proposed project include the construction of any stormwater detention facilities?

☐ Yes ☒ No If no, skip to subsection 3 (*Storm Drainage Systems*).

If yes, has the DEP determined whether a dam construction permit is required? ☐ Yes ☐ No

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)		
	Pre-Development	Post-Development (without detention)	Post-Development (with detention)
2			
10			
100			

The above peak discharges were computed utilizing the: hour duration storm. This duration storm was selected because:

Describe the location of the design point and why this location was chosen:

Section II: Stormwater Management (continued)

If the proposed project increases peak flow rates for the 2, 10 or 100 year frequency discharges, describe the impacts to downstream areas:

Will the detention facility aggravate erosion along the downstream channel?

☐ Yes ☐ No

In certain situations, detention of stormwater aggravates downstream flooding. This occurs when the discharge from a subwatershed is delayed by a detention facility so that it adds to the peak discharge from another subwatershed. Adding the hydrographs of the two subwatersheds results in a higher peak discharge over that which would occur if detention were not present.

Is the location of the detention facility within the watershed suitable for detention?

☐ Yes ☐ No

Explain:

3. Storm Drainage Systems

Does the proposed project include the construction of subsurface storm drainage systems?

☒ Yes ☐ No If no, you have completed Section II of the worksheets.

If yes, complete this subsection:

- a. *DOT Standards* - Is the proposed storm drainage system designed in accordance with the Connecticut Department of Transportation's (DOT) Drainage Manual? ☒ Yes ☐ No

If no, describe the lower design standards and the reasons for not complying with the Drainage Manual:

- b. *Design Storm* - Is the storm drainage system designed for a ten year frequency storm without closing the use of the facility? ☒ Yes ☐ No

- c. *Future Development* - Has the design of the system considered future development of adjacent properties? ☒ Yes ☐ No

Section II: Stormwater Management (continued)

- d. *Outlet Protection* - Have the outlets from the system been designed to minimize the potential for downstream erosion? ☒ Yes ☐ No
- e. *Overland Flow* - Has the use of curbing been minimized to encourage overland dispersed flow through stable vegetated areas? ☒ Yes ☐ No
- f. *Vegetated Filter Strips* - Has the design incorporated the use of vegetated filter strips or grass swales to improve the quality of water outletting from the storm drainage system? ☒ Yes ☐ No
- g. *Stormwater Treatment* - Describe features of the stormwater collection system intended to improve the quality of stormwater runoff prior to its discharge to surface waters.

The stormwater collection system will outlet into a sedimentation basin to reduce velocity and introduce improvements to the water quality volume by filtering 30% of Water Quality Flow prior to its discharge to surface waters and the Hockanum River.

- h. *E & S Control Plan* - Has the design and installation of the storm drainage system been coordinated with the soil erosion and sediment control plan prepared in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control? ☒ Yes ☐ No

Explain:

The type, location, and details of the erosion and sediment controls for the project are shown on the permit plans provided as Attachment G of the DEEP permit application. The permit plans also identify the existing and proposed roadway drainage systems. The erosion and sediment controls are consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. Additionally, the contractor is bound by the conditions set forth in ConnDOT's Standard Specifications for Roads, Bridges, and Incidental Construction, Section 1.10 - Environmental Compliance, Best Management Practices.

Section III: State Grants and Loans

Name of Applicant:

Name of Proposed Project:

1. This Flood Management Certification concerns a: ☐ grant ☐ loan

2. Total amount of grant or loan: \$

3. The recipient of the grant or loan will be:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Phone:

ext.

Fax:

Recipient Contact person:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Phone:

ext.

Fax:

4. The recipient will use the grant or loan to (check all that apply):

- ☐ construct a structure, obstruction or encroachment or conduct other work within a floodplain or coastal high hazard area.
- ☐ construct a facility or develop a site affecting drainage and stormwater runoff.
- ☐ conduct a study or prepare a report concerning land use or land use planning affecting a floodplain, drainage or stormwater runoff.

5. If the grant or loan is for a study or report, describe the anticipated effects on floodplains, drainage or stormwater runoff if the recommendations are implemented:

6. Will the proposed project promote development in floodplains or will utilities servicing the project be located so as to enable floodplain development? ☐ Yes ☐ No

Explain:

If the grant or loan is for construction of a structure, obstruction or encroachment or other work within a floodplain, or if it is for construction of a facility or development of a site that will affect drainage and stormwater runoff, Sections I and/or II of this Worksheet must be completed and the engineering report (Attachment H) and plans (Attachment G) must be provided as part of this application.

Section IV: Disposal of State Land

Name of Applicant:

Name of Proposed Project:

1. The grantee will be:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Phone:

ext.

Fax:

Contact Person:

Phone:

2. Describe the current state of development and use of the land to be disposed.

3. Why is the agency disposing of the land?

4. Describe the grantee's intended use of the land.

5. Will the disposal of the land promote development in floodplains? ☐ Yes ☐ No

Explain:

6. Will the grantee's use of the land be consistent with the state's flood management statutes and regulations?

☐ Yes ☐ No Explain:

**Project 76-193
Temporary Hydraulic Facilities
Analysis Report
for the
Proposed Improvements on
I-84 Exit 63 EB Off-Ramp
and
Intersection of Routes 30 & 83
(Br. No. 05234 and 05238
Over the Hockanum River)

Town of Manchester**

**Prepared by the
CTDOT Hydraulics and Drainage Section
March 2014**

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Project No 76-193
Temporary Hydraulic Facilities Analysis Report
Proposed Improvements on the I-84 Exit 63 EB Off-Ramp
and the
Intersection of Routes 30 & 83
(Br. No. 05234 and 05238 over the Hockanum River)
Town of Manchester

Executive Summary

Proposed project No. 76-193 is located in Manchester at the Intersection of the I-84 eastbound Exit 63 Off-ramp and Routes 30 and 83. The intent of this project is to improve the operation and safety where Routes 30 and 83 intersect with the I-84 Exit 63 On/ Off-ramp. Within the project limits there are three existing bridges that carry state roadways over the Hockanum River. The proposed project will remove existing Bridge No. 05234 which carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. A new bridge structure will be built directly upstream of the existing structure. The proposed structure, which will also be Bridge No. 05234, will carry the proposed realigned Exit 63 Off-Ramp over the Hockanum River. There is a FEMA Flood Hazard Zone AE and a FEMA Floodway associated with this portion of the Hockanum River. The FEMA Floodplain and Floodway limits are coincident in the vicinity of the Exit 83 Off-Ramp Structures. The Flood Insurance Study's Floodway Data Table 16 indicates the floodway is 79ft wide with the reach that includes the existing and proposed Bridge No. 05234. The proposed bridge structure will span 85ft. as measured perpendicular to the flow of the Hockanum River channel, exceeding the width of the FEMA 100-year floodplain and floodway.

Approximately 340ft downstream of existing Bridge No. 05234 is Bridge No. 05238 which carries Route 30 over the Hockanum River. Bridge No. 05238 will have its deck structure slightly modified to allow reconfiguring the lanes however the lower portion of the abutments will not be impacted and the hydraulics of the existing structure will not be changed. Approximately 210ft upstream of existing Bridge No. 05234 is Bridge No. 05235. Bridge No. 05235 carries the existing I-84 Exit 63 On-Ramp over the Hockanum River. No alterations to the structure of Br. No. 05235 are proposed. The hydraulics of Br. No. 05235 will not be impacted by the proposed project.

A hydraulic model was developed to evaluate the potential hydraulic impacts of the proposed work. Two sets of discharges were evaluated with the hydraulic model. FEMA's Flood Insurance study's published peak discharges were run to confirm that the proposed design did not impact the FEMA Floodway and floodplain. Design discharges

were developed to evaluate the potential hydraulic impacts of the project. It was confirmed the Existing and Proposed Bridge No. 05434 structures span the 100-yr. FEMA Floodplain and Floodway and there are no permanent impacts to the FEMA regulated areas. With respect to the Design flows, the 100-year design discharge remains in the existing river channel and does not reach a sufficiently high elevation to be impacted the proposed Bridge No. 05234 abutments. The 500-yr frequency peak design discharge reaches a sufficient elevation to reach the abutments. The Proposed hydraulic conditions are essentially the same as the Existing hydraulic conditions. The bridge abutments will be founded on bedrock, and the Hockanum River channel is heavily riprapped so scour under the 100-year and 500-yr conditions are not a concern. At the request of DEEP-Fisheries, a root-wad will be installed in the bank of the Hockanum River, beneath the proposed bridge.

Temporary Water Handling

Flood Management General Certification will be obtained for this project due to the temporary water handling requirements. The work of excavating for the proposed abutments in close proximity to the stream channel will require the stream channel embankment to be supported to insure the Hockanum River does not breach the streamside embankment and flow into the excavation. Cofferdaming with driven sheet piling is not feasible due to the shallow bedrock. It is proposed to place large sandbags/flow diversion structures along stream bank and into excavated area beyond the stream bank to reduce amount of potential water seepage through stream bank into the excavated area. Some dewatering may be required. The temporary water handling scheme was designed using the hydraulic model. It is anticipated that the temporary water handling facilities will be in place for less than 15 months. Large sandbags/flow diversion water handling structures will be placed along the stream channel adjacent to and within the excavations required to construct the proposed bridge abutments. The large sandbags/flow diversion water handling structures will be placed to provide a minimum 51ft wide channel width. The top of the streamside sandbags\ flow diversion water handling structures will be a minimum elevation of 164.0ft., slightly above the elevation of the 5-year frequency event water surface elevation. The temporary water handling facilities will be removed following the construction of the abutments.

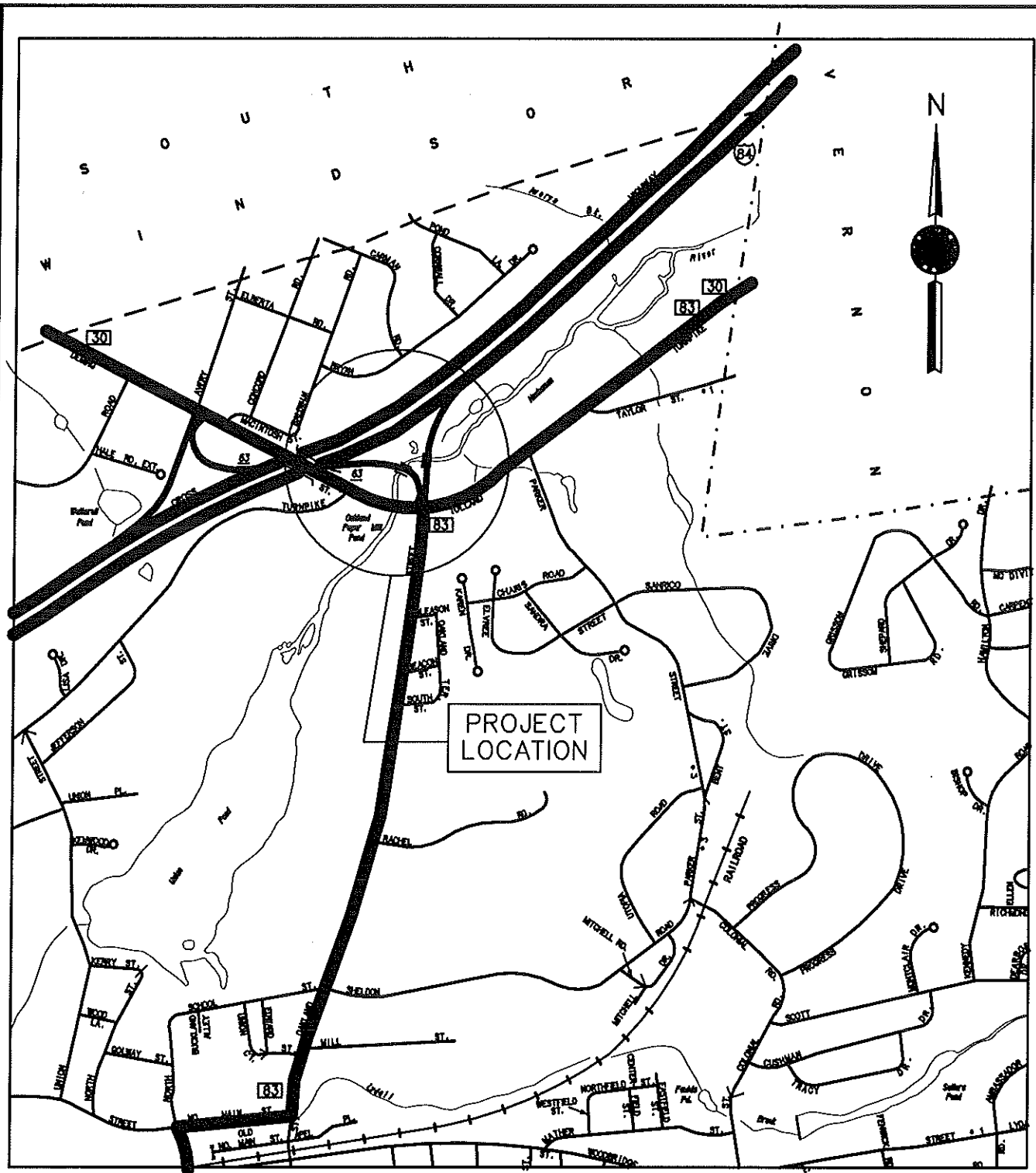
As per Form 816's "Best Management Practices," the Contractor will be required to coordinate with National Oceanic and Atmospheric Administration (N.O.A.A.) weather service for warnings pertaining to major storms, severe thunderstorms, or other similarly severe weather conditions or effects. In the event a major storm event is predicted, all floatable materials and equipment will be removed from within the in-channel work area

and the subject area secured. In the event that floodwaters top the Temporary Hydraulic Facilities, the discharge will be allowed to flow through the work area. Any disturbance resulting from the flooding of the work area is anticipated to be minor. Any disturbances will be repaired and stabilized as soon as possible.

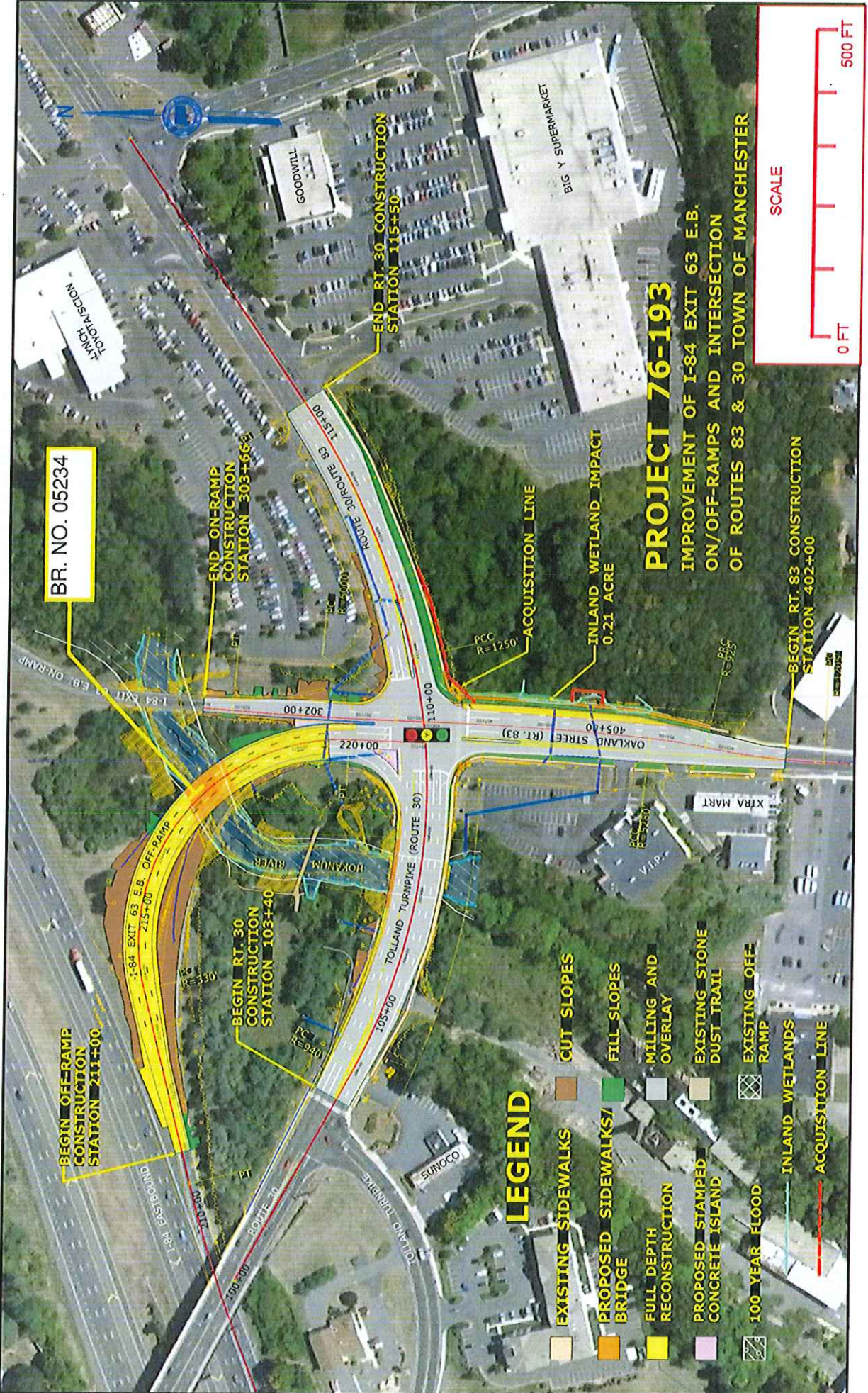
The following report documents that the Temporary Hydraulic Facilities were designed in accordance with the Drainage Manual's Chapter 6, Appendix F "Temporary Hydraulic Facilities." Electronic copies of the hydraulic models used for the evaluation of the FEMA and Design discharges are included on the disk that accompanies this report.

Section I

Location Maps and Figures

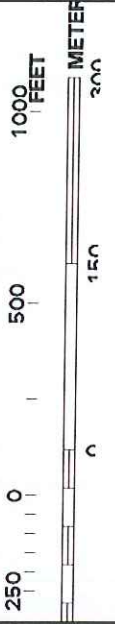


PROJECT 76-193 - LOCATION PLAN
I-84 - E.B. EXIT 63, MANCHESTER



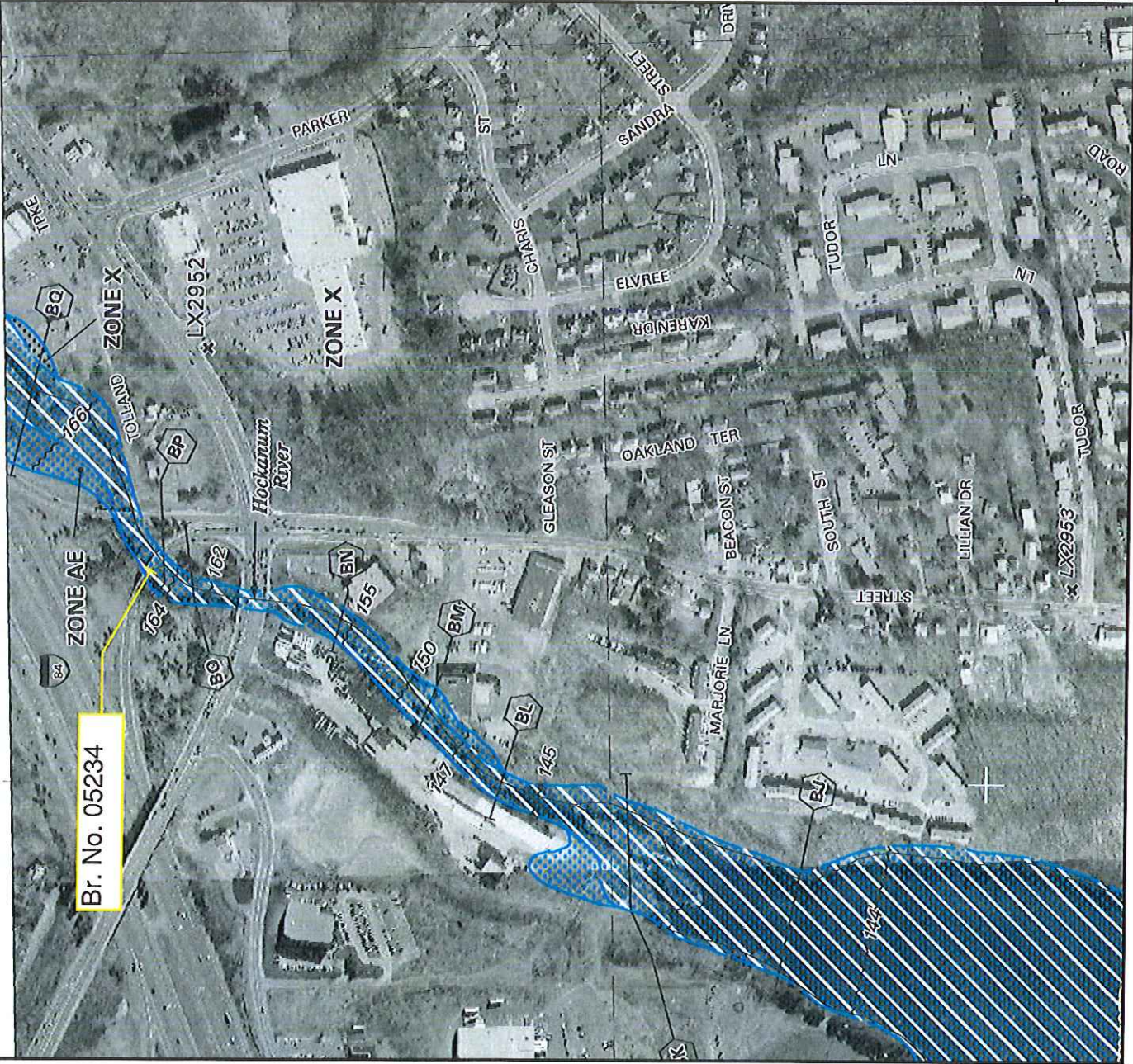


MAP SCALE 1" = 500'



1065000 FT

JOINS PANEL 0384



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0392F

FIRM
FLOOD INSURANCE RATE MAP
HARTFORD COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 392 OF 675
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
COMMUNITY
MANICESTON, TOWN OF

NUMBER	PANEL	SUFFIX
09001	0392	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown below will be used on insurance applications for the subject community.



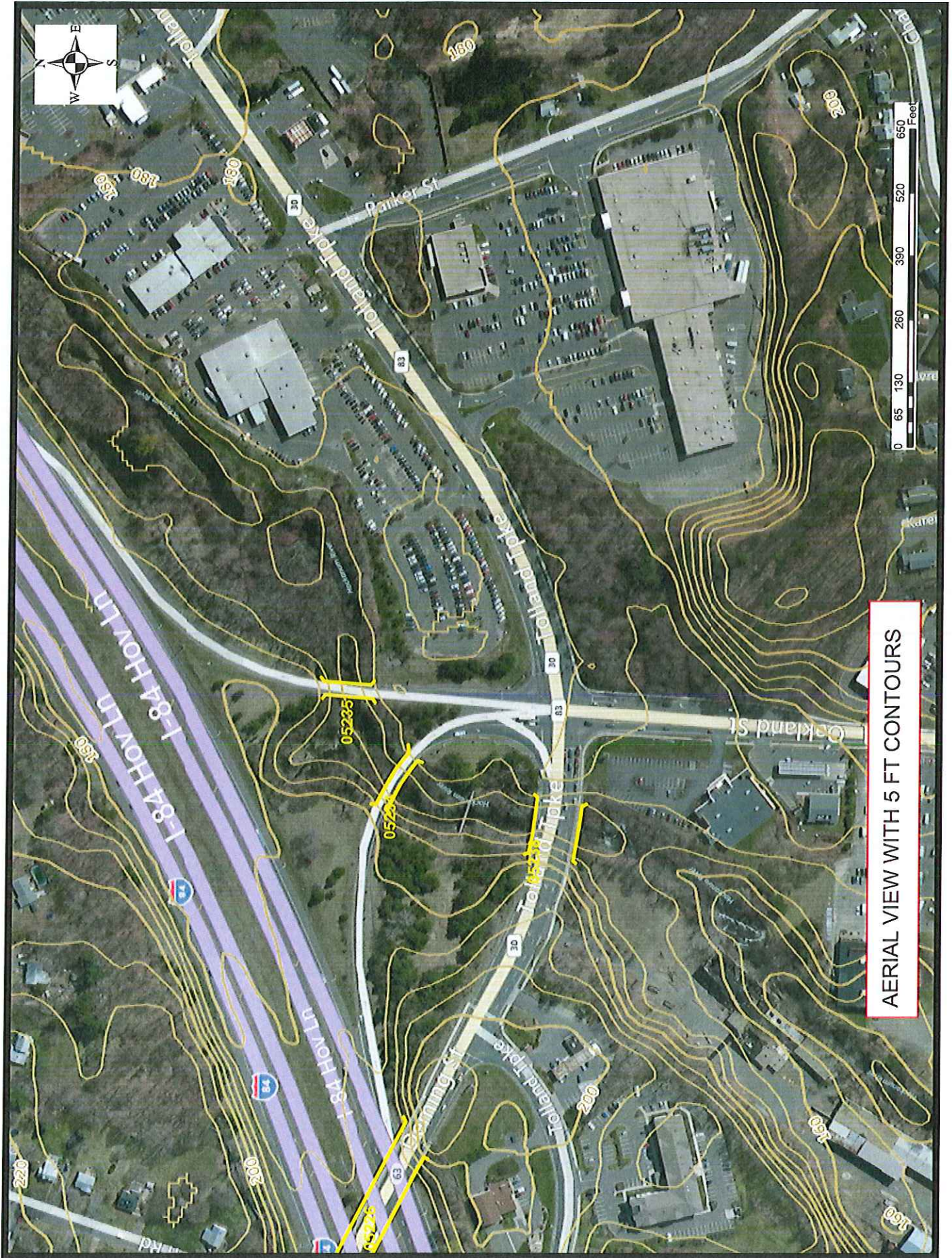
MAP NUMBER
09003C0392F
EFFECTIVE DATE:
SEPTEMBER 26, 2008

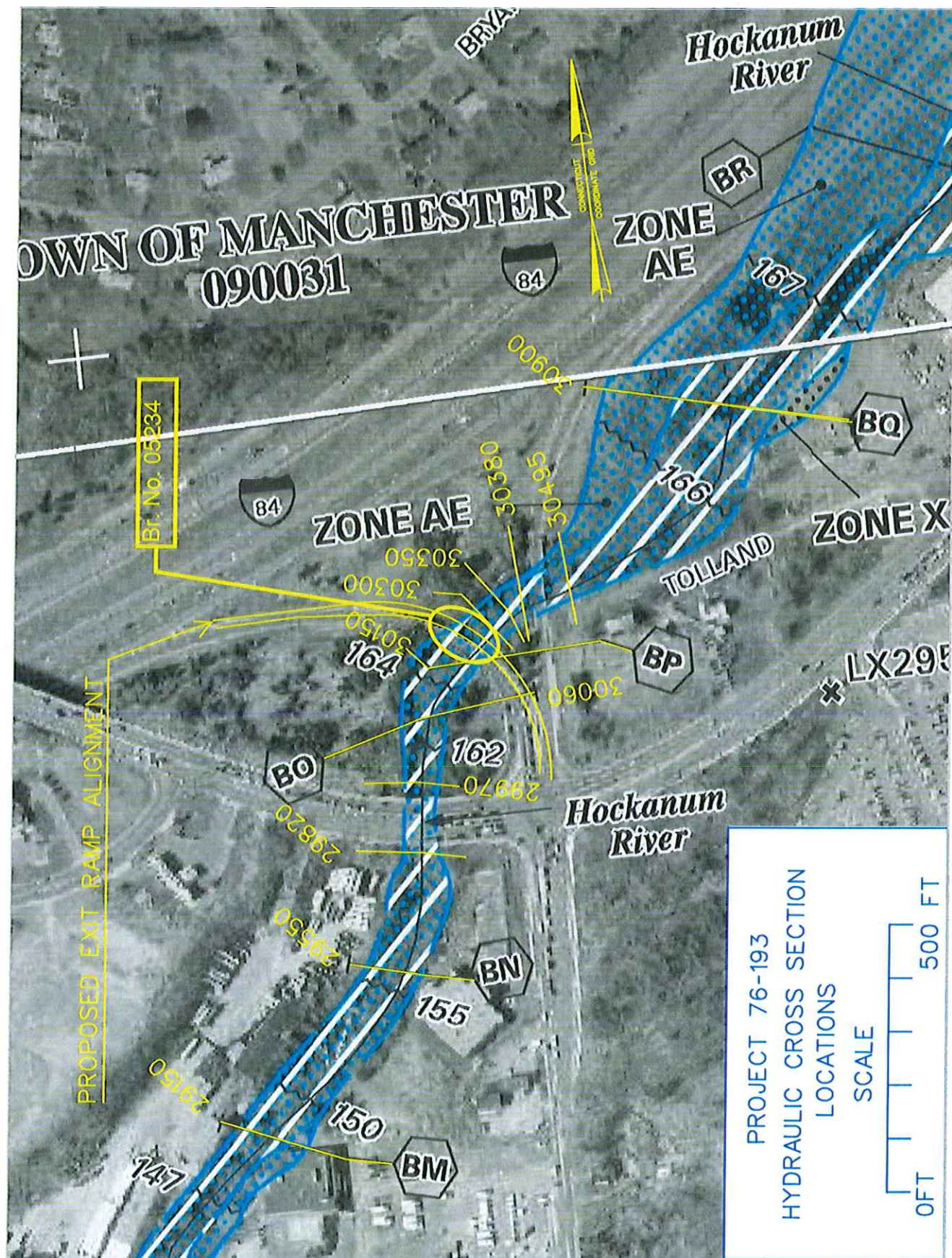
Federal Emergency Management Agency

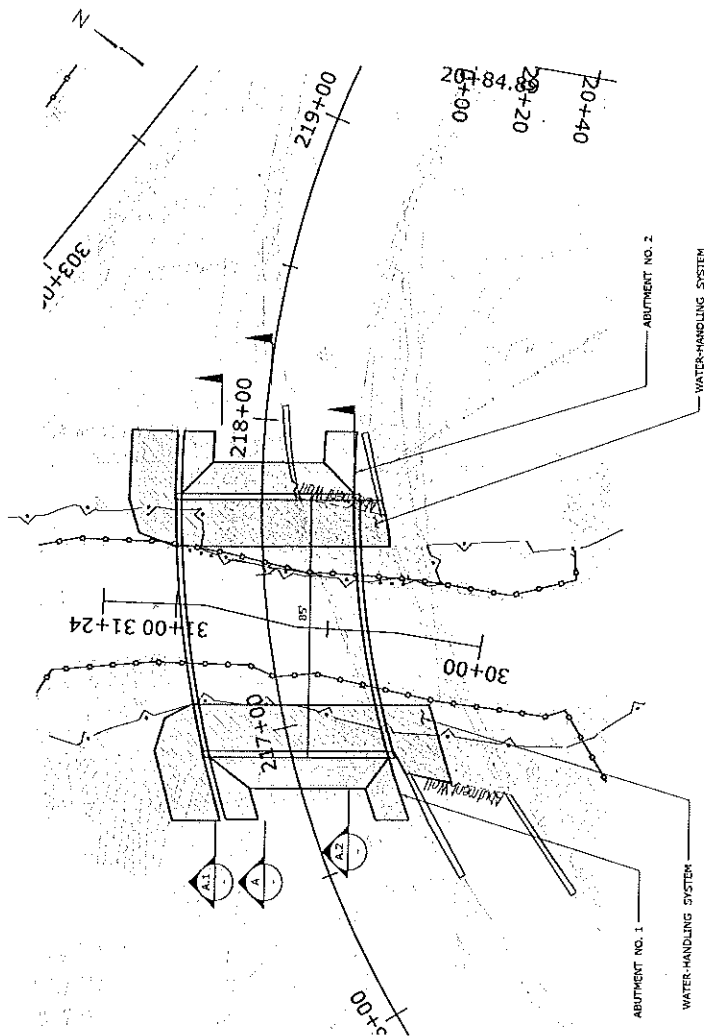
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



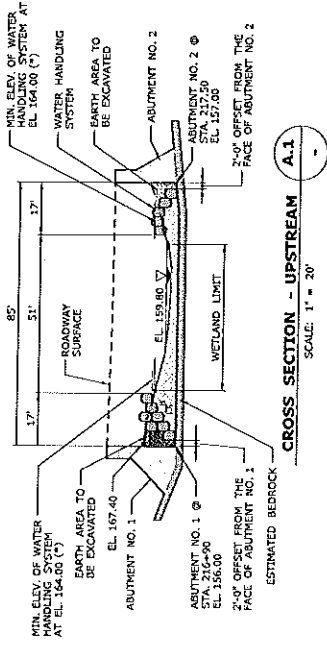
AERIAL VIEW WITH 5 FT CONTOURS



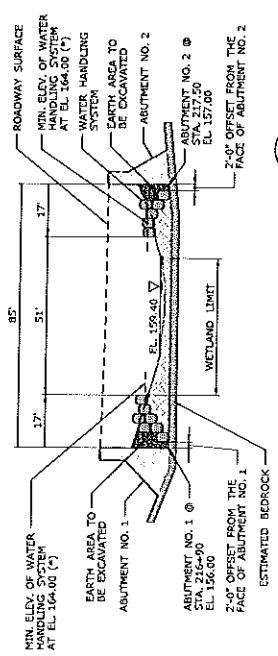




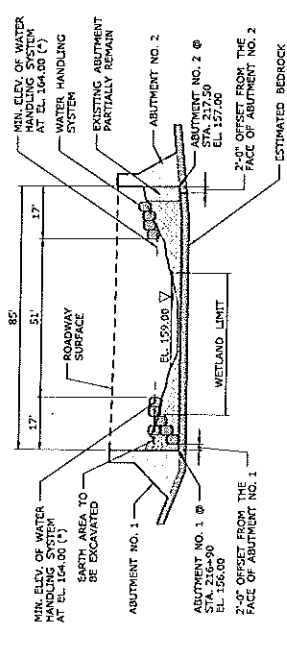
GENERAL PLAN - BRIDGE NO. 05234
SCALE: 1" = 20'



CROSS SECTION - UPSTREAM (A.1)
SCALE: 1" = 20'



CROSS SECTION - BRIDGE CENTER (A)
SCALE: 1" = 20'



CROSS SECTION - DOWNSTREAM (A.2)
SCALE: 1" = 20'

NOTE
(*) REQUIRED FOR A 5-YEAR STORM EVENT

PRELIMINARY DESIGN REVIEW MANCHESTER WATER HANDLING PLAN		PROJECT NO. 76-193
REPLACEMENT OF BRIDGE #05234		SHEET NO. 1
OFFICE OF ENGINEERING STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		SCALE AS NOTED
THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF THE STATE OF CONNECTICUT. IT IS TO BE USED ONLY FOR THE PROJECT AND FOR THE PURPOSES FOR WHICH IT WAS PREPARED. NO PART OF THIS DOCUMENT IS TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT PERMISSION IN WRITING FROM THE STATE OF CONNECTICUT.		DATE 10/1/87
DRAWN BY BBE/BKC CHECKED BY BKC		PROJECT TITLE REPLACEMENT OF BRIDGE #05234
DRAWN BY BBE/BKC CHECKED BY BKC		PROJECT NO. 76-193
DRAWN BY BBE/BKC CHECKED BY BKC		SHEET NO. 1

Section II

Narrative

Project Description

Proposed project No. 76-193 is located in Manchester at the Intersection of the I-84 eastbound Exit 63 Off-ramp and Routes 30 and 83. The intent of this project is to improve the operation and safety where Routes 30 and 83 intersect with the I-84 Exit 63 On/ Off-ramp. Within the project limits there are three existing bridges that carry state roadways over the Hockanum River. There is a FEMA Flood Hazard Zone AE and a FEMA Floodway associated with this portion of the Hockanum River. The proposed project will remove existing Br. No. 05234 which carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River and construct a new bridge structure to carry the proposed realigned Exit 63 Off-Ramp over the river. Bridge No. 05238, which carries Route 30 over the Hockanum River, will have the deck structure slightly modified however the supporting substructure of the existing structure will not be impacted. Bridge No. 05235 which carries the existing I-84 Exit 63 On-Ramp over the Hockanum River will not be hydraulically impacted by the proposed project.

A full realignment and reconstruction of the Exit 63 Off-ramp is proposed. Existing Bridge No. 05234 carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. Realigning the Off-ramp will require removing the existing bridge and constructing a new structure to carry the realigned Exit Ramp. The existing bridge abutments are outside of the FEMA 100-yr floodplain and Floodway. Constructing the proposed replacement structure for Br. No. 05234 will involve the placing new abutments directly upstream and in general, in-line with the existing abutments. A portion of the existing northern abutment may be incorporated into the proposed replacement structure. The unincorporated portion of the northern abutment and the existing southern abutment will be removed down to ground level. There is a FEMA Flood Hazard Zone AE and a FEMA Floodway associated with this portion of the Hockanum River. The FEMA Floodplain and Floodway limits are coincident in the vicinity of the Exit 83 Off-Ramp Structures. The Flood Insurance Study's Floodway Data Table 16 indicates the floodway is 79ft wide within the reach that includes the existing and proposed Bridge No. 05234. The proposed bridge structure will span 85ft. as measured perpendicular to the flow of the Hockanum River channel, exceeding the width of the FEMA 100-year floodplain and floodway.

Bridge No. 05238 carries Route 30 over the Hockanum River. Bridge No. 05238 is located approximately 340ft downstream of Bridge No. 05234. The bridge deck of Bridge No. 05238 will be structurally modified to allow reconfiguring the Route 30 lane alignment. All work on Bridge No. 05238 will be done from the Bridge deck. The existing bridge abutments are outside of the FEMA 100-yr floodplain and Floodway limits. There

will be no impact, either permanent or temporary to the FEMA regulated area below the subject bridge.

Bridge No. 05235 is located approximately 210ft upstream of Bridge No. 05234 and carries the existing I-84 Exit 63 On-Ramp over the Hockanum River. No alterations to the structure of Br. No. 05235 are proposed. The hydraulics of Br. No. 05235 will not be impacted by the proposed project.

At the request of DEEP-Fisheries, a root-wad will be installed in the bank of the Hockanum River, beneath proposed Bridge No. 05234. Consistent with current Connecticut hydraulic modeling conventions, the root-wad/Fisheries enhancement was not included in the hydraulic modeling.

It was determined that two sets of peak discharges would be required for evaluate the various regulatory and design impacts of this project. Published FEMA discharges were evaluated in the hydraulic model to ensure there were no adverse impacts to the FEMA regulatory areas. Based on the published FEMA FIS Profile of this reach of the Hockanum River, FEMA's information is outdated and does not include bridge structures that were built in the 1980's. The current Flood Insurance Study's Flood Data table indicates the Floodway is 79ft. wide through the reach where the existing Br. No. 05234 is located. FEMA mapping indicates the floodway and 100-yr floodplain limits coincide in this section of the Hockanum River. The exiting and proposed Bridge No. 05234 abutments are 85ft apart, measured perpendicular to the stream flow. Even though the proposed and existing Br. No 05234 bridge abutments span the delineated FEMA Floodplain and Floodway; to ensure that there were no impacts to the FEMA regulated areas, the FIS discharges were evaluated with hydraulic models that reflect the Existing and Proposed conditions. The analysis confirms no permanent impact to FEMA regulated areas. Discharges based on Streamstats generated discharges were used for the Design evaluation of the replacement bridge structure. The proposed Temporary Water Handling facilities were evaluated using the Design discharges.

Hydrology

The peak discharges for the Hockanum River for the "Design" of the replacement Br. No. 05234 structure were determined by adjusting Streamstats generated discharges based on the ratio of gaged flow to Streamstats estimated flows at a downstream Streamgauge station. The Design discharges are presented in the following table.

Table 1. Design Discharges

Peak Discharges (cfs)					
2-yr	10-yr	25-yr	50-yr	100-yr	500-yr
820	1720	2240	2660	3180	4520

The FEMA discharges were obtained from the FEMA Flood Insurance Study for Hartford County, revised September 16, 2011. Existing Bridge No. 05234 is approximately 4300ft downstream from the corporate limit of the Town of Manchester and the Town of Vernon. FIS discharge data compiled for this corporate limit was used for the analysis. According to the FEMA FIS, the drainage area to the subject site is 45.3 sq. mi². Table 3 presents the FIS Peak Discharges evaluated for this project.

Table 2. FIS Peak Discharges

Frequency	10-year	50-year	100-year	500-year
Discharge (cfs)	1,300	2,300	2,900	5,000

The FEMA Flood Insurance Study discharges were evaluated as part of the hydrologic evaluation of the project site and the FEMA discharges were run in the HEC-RAS hydraulic models to confirm that the proposed work associated with Project 76-193 did not permanently impact the FEMA regulatory areas along the Hockanum River. The proposed temporary water handling scheme will result in temporary impacts within the FEMA regulatory area.

Hydraulic model

Existing Condition Model

The U.S. Army Corps of Engineers hydraulic analysis program HEC-RAS version 4.1.0 was used to evaluate the hydraulic impacts of the proposed project. The hydraulic analysis model is based on the hydraulic model originally developed by United States Geological Survey (USGS) for the FEMA Floodway Analysis. The original cross section data was obtained from the CTDEEP's Water Management Central Bureau. This data was in the "USGS Step-Backwater Program - Version 77.180" format. According to the Flood Insurance Study, (FIS), the original cross section data used for the FEMA backwater analysis was obtained from field survey. All elevation values in the original study reference NGVD29, as does the ground survey obtained for Project 76-193. The

original USGS Cross Section data was input into the HEC-RAS program. The hydraulic model utilized bounding cross sections associated with the lettered FEMA cross sections. The cross section stationing references the same stationing used in the FEMA FIS which relates the section location to the distance in feet upstream of the Manchester Corporate limits.

The Existing Condition model represents an integration of the original USGS hydraulic cross section data, and Project No. 76-193 survey information. The I-84 On and Off-Ramp bridges and the eastbound expressway alignment were built in the early 1980's as part of the I-84 (I-86) construction and were therefore not included in the original modeling. A structure that the current effective FIS Profile refers to as "Tolland Turnpike", located between HEC-RAS sections RS-29970 and RS-29820, was removed during the 1980's I-84 construction and another bridge, Bridge No. 05238, was constructed slightly downstream. Although the currently effective September 26, 2008 Flood Insurance Rate Map (FIRM), which incorporates aerial photography, shows the subject existing structures, they are not represented in the Flood Profile included in the Flood Insurance Study. Additionally, the current FIS profile indicates the "Tolland Turnpike" bridge is located between FEMA lettered sections "BO" and "BP" while the FIS aerial photo based map clearly show the existing bridge, Bridge No 05238, is located between sections FEMA lettered sections "BN" and "BO." To better represent the existing site conditions, the original "Tolland Turnpike" structure was removed from USGS base hydraulic model and a bridge representing the dimensions of Bridge No. 05238 was included in the Existing Condition model. Additional cross sections generated from 3-Dimensional CTDOT survey information were added to the hydraulic model to represent the two I-84 Ramp structures in the Existing Condition model. The addition of the cross sections associated with the Off-Ramp structure and the incorporation of Bridge No. 05238 produced a model that is significantly more detailed than the original hydraulic modeling in the vicinity of the subject structures.

The starting water surfaces for the FEMA analysis were obtained from the Flood Data Table in the current FIS. The currently effective FIS referenced the NAVD88 Datum, so the elevations were adjusted to reference NGVD29 Datum by adding 1ft to the water surface elevations. The FIS Flood Data Table is included in the appendix of this report. A subcritical flow regime was used for the FEMA analysis.

Normal depth was used as the downstream bounding conditions for the Design flow analysis with critical depth as the upstream bounding condition. A mixed flow regime was used for the Design analysis.

The river stationing used in the HEC-RAS analysis refers to the "Distance above Town of Manchester Corporate Limits" value as presented in the current FEMA Flood Insurance study. The published FEMA lettered section reference is included in the HEC-RAS cross section descriptions. The Connecticut Department of Transportation (DOT) generated sections used to better define the Existing Conditions are indicated in the HEC-RAS cross section descriptions.

Proposed Condition

For the proposed condition, Existing Br. No. 05234 was removed from the model and the proposed structure was inserted slightly upstream of where the existing structure was, between the same upstream and downstream bounding sections. In both the Existing and Proposed models, the subject bridge structure is located between cross sections RS30300 and RS30150. The existing and proposed structures were assigned different River Stations to reflect the different locations. The Proposed bridge low chord is slightly above the Existing structure's low chord elevation. No impacts are proposed below the bank-line or 100-yr water surface elevation within the Hockanum River channel; however, merely shifting the location of the internal bridge sections in the HEC-RAS model resulted in minor, inadvertent changes to the channel between RS30300 and RS30150, so the internal bridge sections were slightly adjusted to better reflect the proposed condition at the upstream location.

Floodway Analysis

An evaluation of the proposed condition indicates the 100-year FEMA water surface elevation at the upstream limits of the proposed structure abutments is approximately 165.73ft, which matches the Existing condition HEC-RAS water surface elevation at this location and is consistent with the 100-year water surface elevation as presented in the FIS Hockanum River Flood Profile 197P. Approximately 5ft of freeboard from the low-point of the low-cord will be provided. The Floodway analysis of Br. No. 05234 (Br. No. 30219 in the models) confirms that the Existing and Proposed Br. No. 05234 span the FEMA floodway and floodplain. The proposed project does not permanently impact the channel and floodplain areas below the FEMA 100-yr water surface elevation.

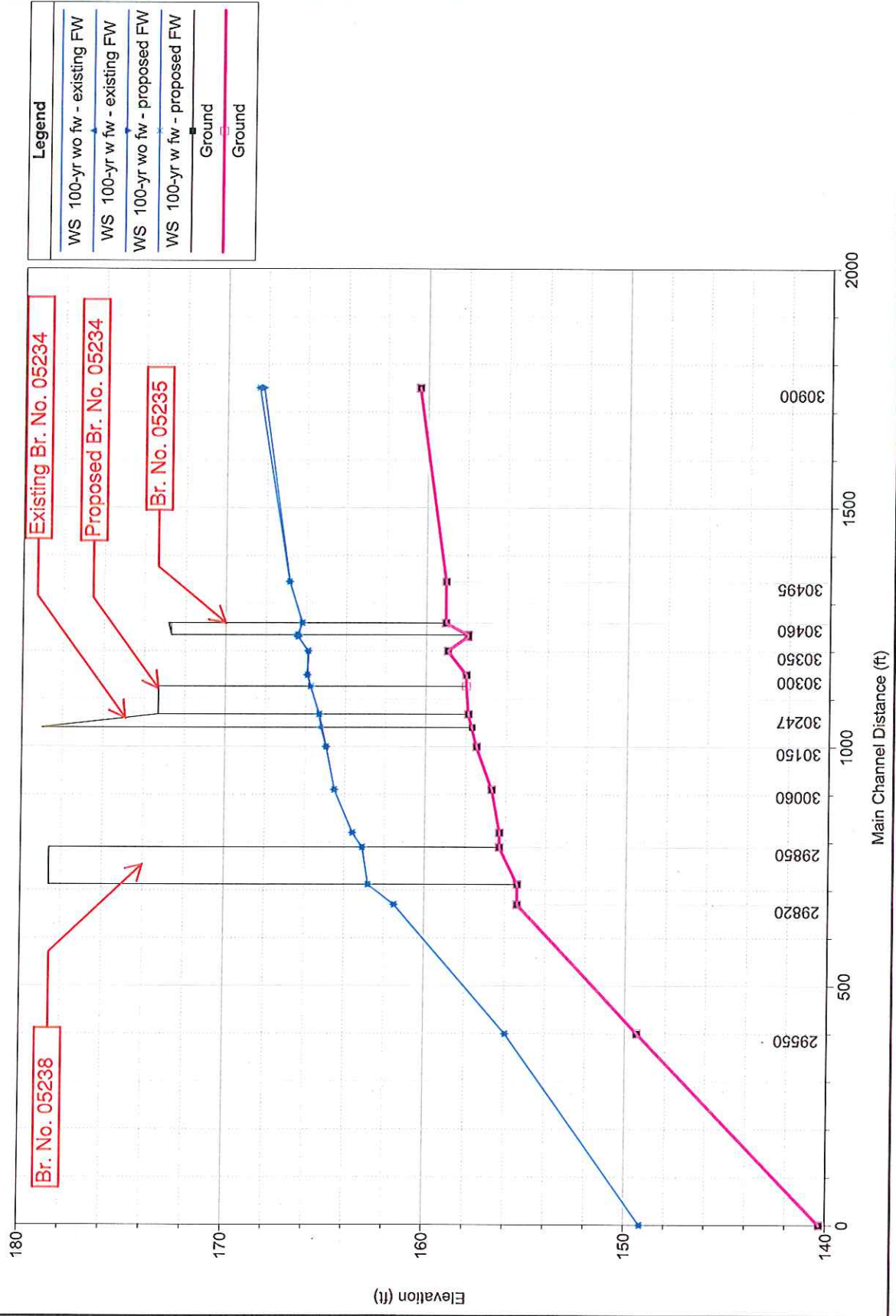
"Design" Hydraulic Analysis

An evaluation of the proposed condition indicates the 100-year FEMA water surface elevation within the limits of the proposed structure at the upstream limits of the abutments is approximately 166.1ft, which matches the Existing condition HEC-RAS water surface elevation at this location. Approximately 4.7ft of freeboard from the low-point of the low-cord will be provided. The existing stream banks have an extensive revetment consisting of Intermediate, and larger sized riprap. There are no reported

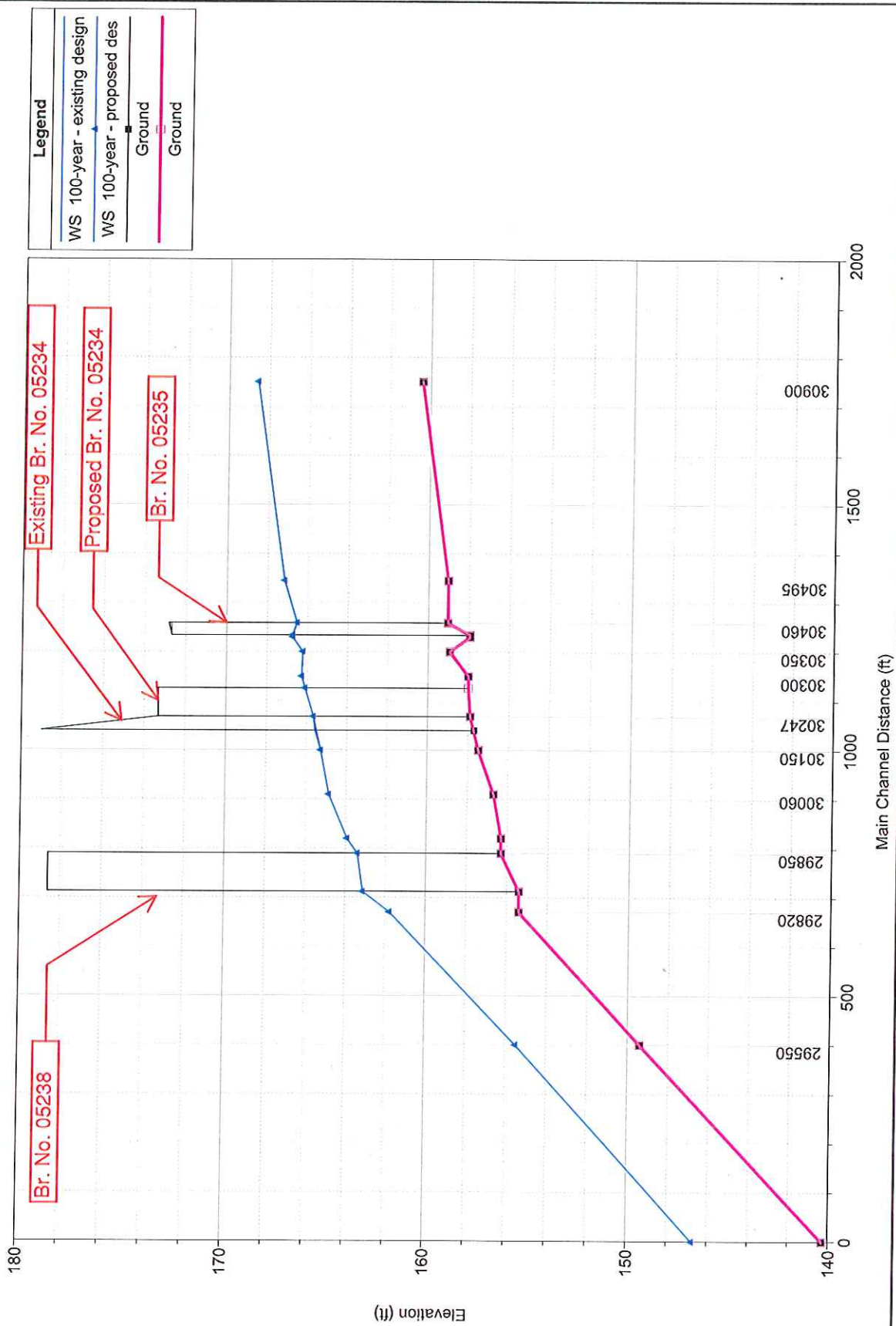
scour or stream bank erosion problems in the vicinity of the existing bridge. Existing and proposed average velocities are in the range of 7ft/s to 8ft/s in the vicinity of the proposed structure, similar to at the existing location. Retaining the existing revetment; or, replacing the revetment in-kind, where required, will be sufficient erosion protection.

In summary, the hydraulic analysis of Br. No. 05234 (Br. No. 30219 in the models) confirms that the Existing and Proposed Br. No. 05234 span the FEMA floodway and floodplain. The proposed project does not permanently impact the channel and floodplain areas below the FEMA or Design 100-yr water surface elevation. A comparison plot of the HEC-RAS profiles of the FEMA 100-year discharge and the 100-yr Design discharge is presented on the following pages. The CD included with the report includes the HEC-RAS modeling used for the FEMA Floodway and the Design Analysis. Based on this conclusion, there will be no further discussion of the overall analysis results in this report.

final 76-193 Hockanum River 2014 Plan: 1) existing FW 2) proposed FW
 Geom: Existing Flow: Floodway



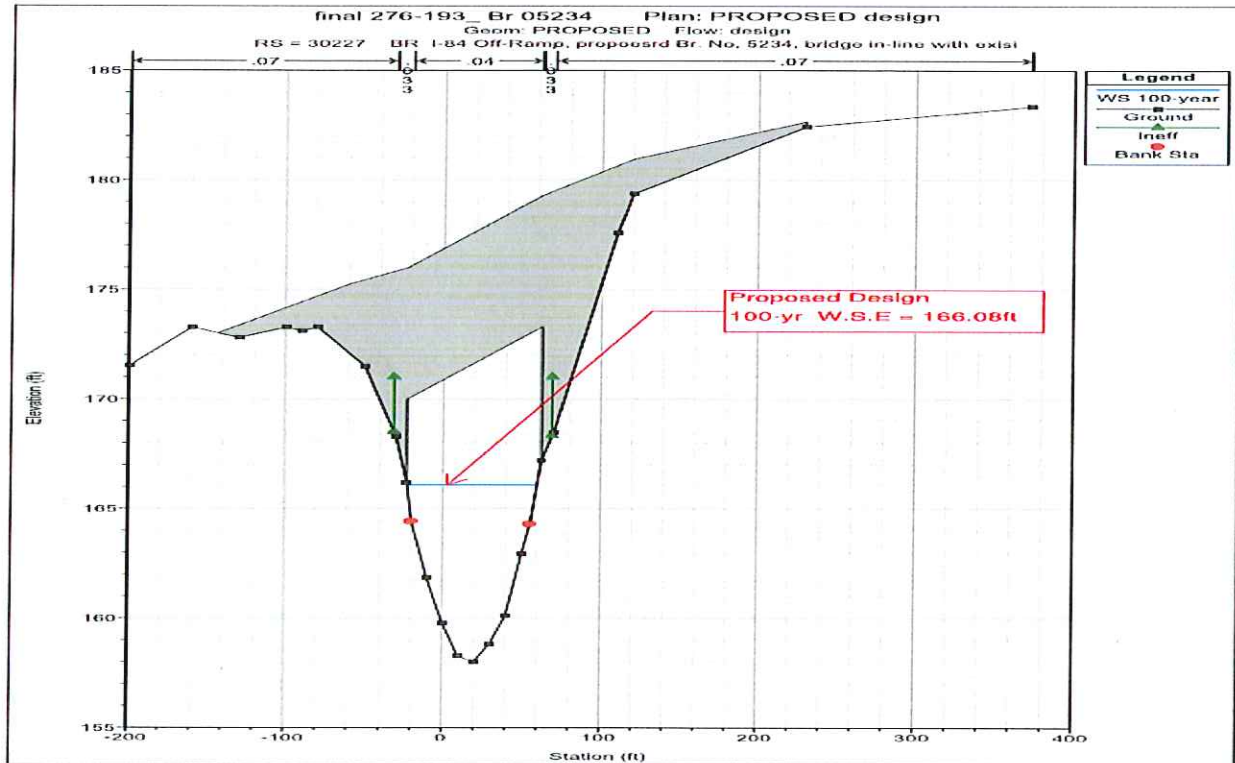
final 76-193 Hockanum River 2014 Plan: 1) existing design 2) proposed des
 Geom: Existing Flow: design



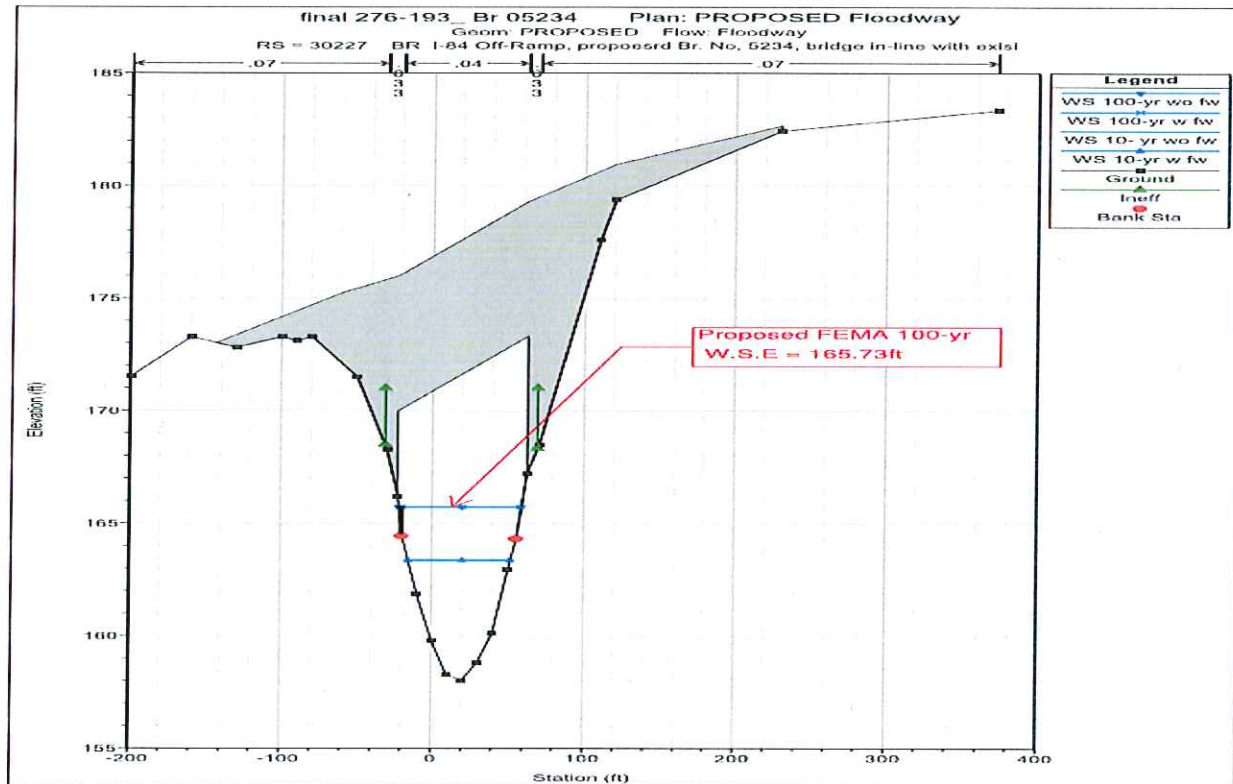
Project 76-193

Temporary Hydraulic Facilities Data Table

Average Daily Flow	85 cfs
Average Spring Flow	164 cfs
2-year Frequency Discharge	820 cfs
Temporary Design Discharge	1330 cfs
Temporary Design Frequency	5-year
Temporary Water Surface Elevation Upstream	163.6 ft
Temporary Water Surface Elevation Downstream	162.7 ft



Proposed Upstream Cross Section Br. No. 05234 – 100-yr Design Frequency

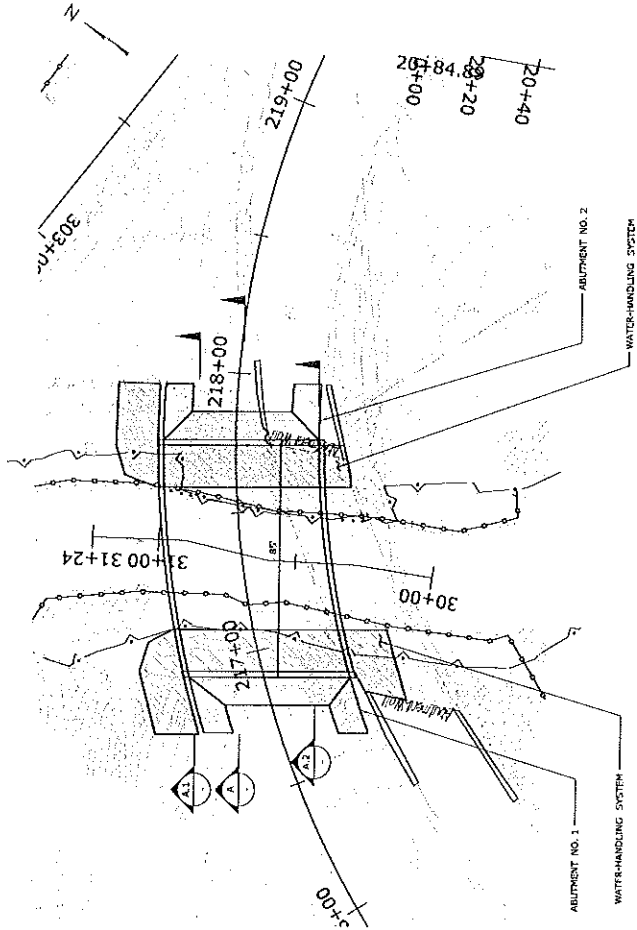


Proposed Upstream Cross Section Br. No. 05234 – 100-yr FEMA Frequency

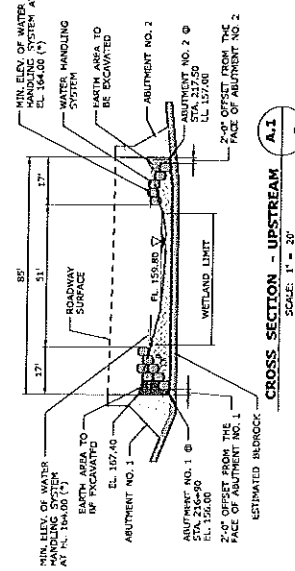
Temporary Water Handling

Flood Management General Certification will be obtained for this project due to the temporary water handling requirements. The work of excavating for the proposed abutments in close proximity to the stream channel will require the stream channel embankment to be supported to insure the Hockanum River does not breach the streamside embankment and flow into the excavation. Cofferdaming with driven sheet piling is not feasible due to the shallow bedrock. It is proposed to place large sandbags/flow diversion structures along stream bank and into excavated area beyond the stream bank to reduce amount of potential water seepage through stream bank into the excavated area. Some dewatering may be required. The temporary water handling scheme was designed using the hydraulic model. It is anticipated that the temporary water handling facilities will be in place for less than 15 months. Large sandbags/flow diversion water handling structures will be placed along the stream channel adjacent to and within the excavations required to construct the proposed bridge abutments. The large sandbags/flow diversion water handling structures will be placed to provide a minimum 51ft wide channel width. The top of the streamside sandbags\ flow diversion water handling structures will be a minimum elevation of 164.0ft., slightly above the elevation of the 5-year frequency event water surface elevation. The temporary water handling facilities will be removed following the construction of the abutments.

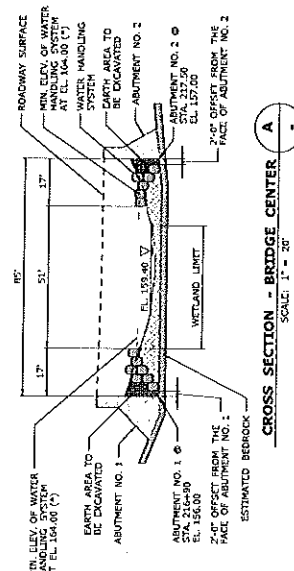
As per Form 816's "Best Management Practices," the Contractor will be required to coordinate with National Oceanic and Atmospheric Administration (N.O.A.A.) weather service for warnings pertaining to major storms, severe thunderstorms, or other similarly severe weather conditions or effects. In the event a major storm event is predicted, all floatable materials and equipment will be removed from within the in-channel work area and the subject area secured. In the event that floodwaters top the Temporary Hydraulic Facilities, the discharge will be allowed to flow through the work area. Any disturbance resulting from the flooding of the work area is anticipated to be minor. Any disturbances will be repaired and stabilized as soon as possible.



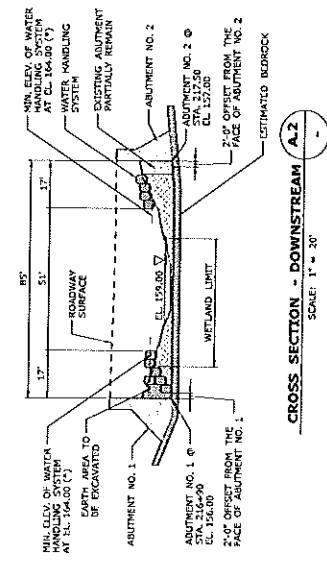
GENERAL PLAN - BRIDGE NO. 05234
SCALE: 1" = 20'



CROSS SECTION - UPSTREAM A-1
SCALE: 1" = 20'



CROSS SECTION - BRIDGE CENTER A
SCALE: 1" = 20'



CROSS SECTION - DOWNSTREAM A-2
SCALE: 1" = 20'

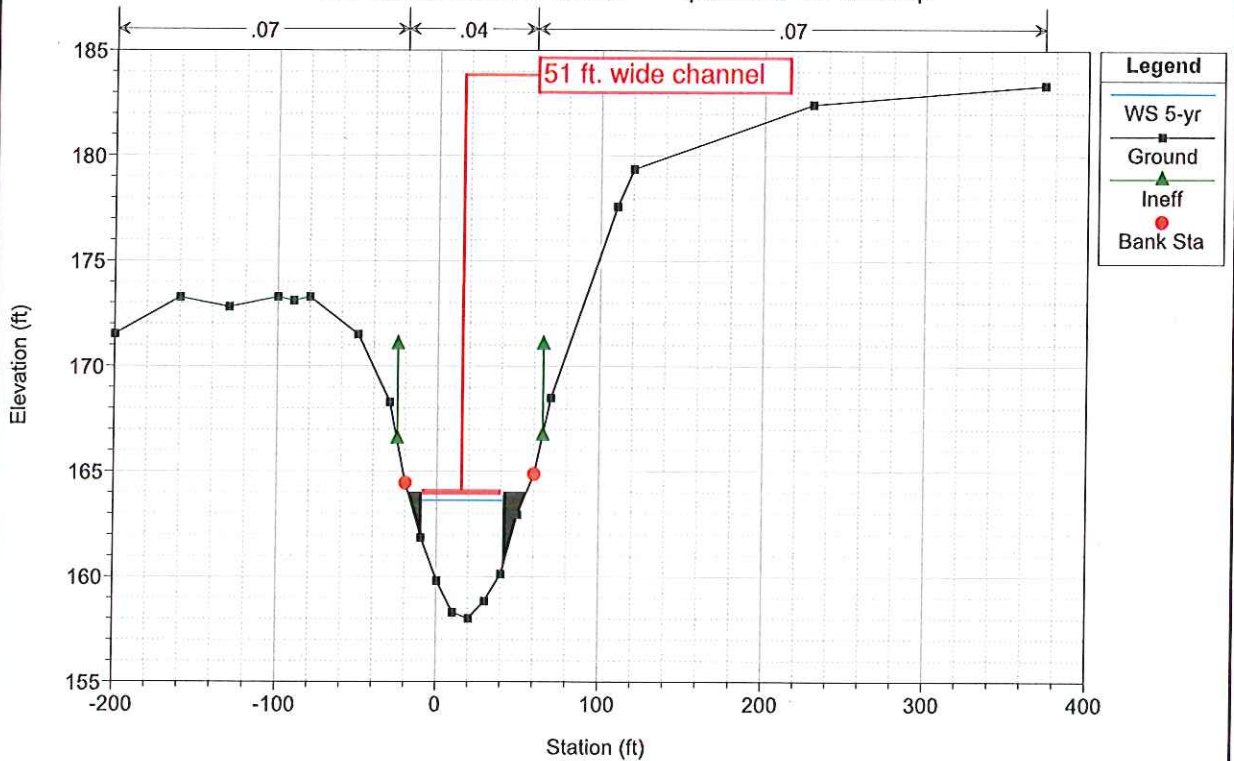
NOTE
(*) REQUIRED FOR A 5-YEAR
STORM EVENT

PRELIMINARY DESIGN REVIEW	
REPLACEMENT OF BRIDGE #05234	MANCHESTER
PROJECT NO.	76-193
DESIGN NO.	
WATER HANDLING PLAN	
STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING
DESIGNED BY BKF/BKC	SCALE AS NOTED
PROJECT NO.	SHEET NO.

final 76-193 Hockanum River 2014 Plan: Temporary

Geom: Temporary Flow: Temporary

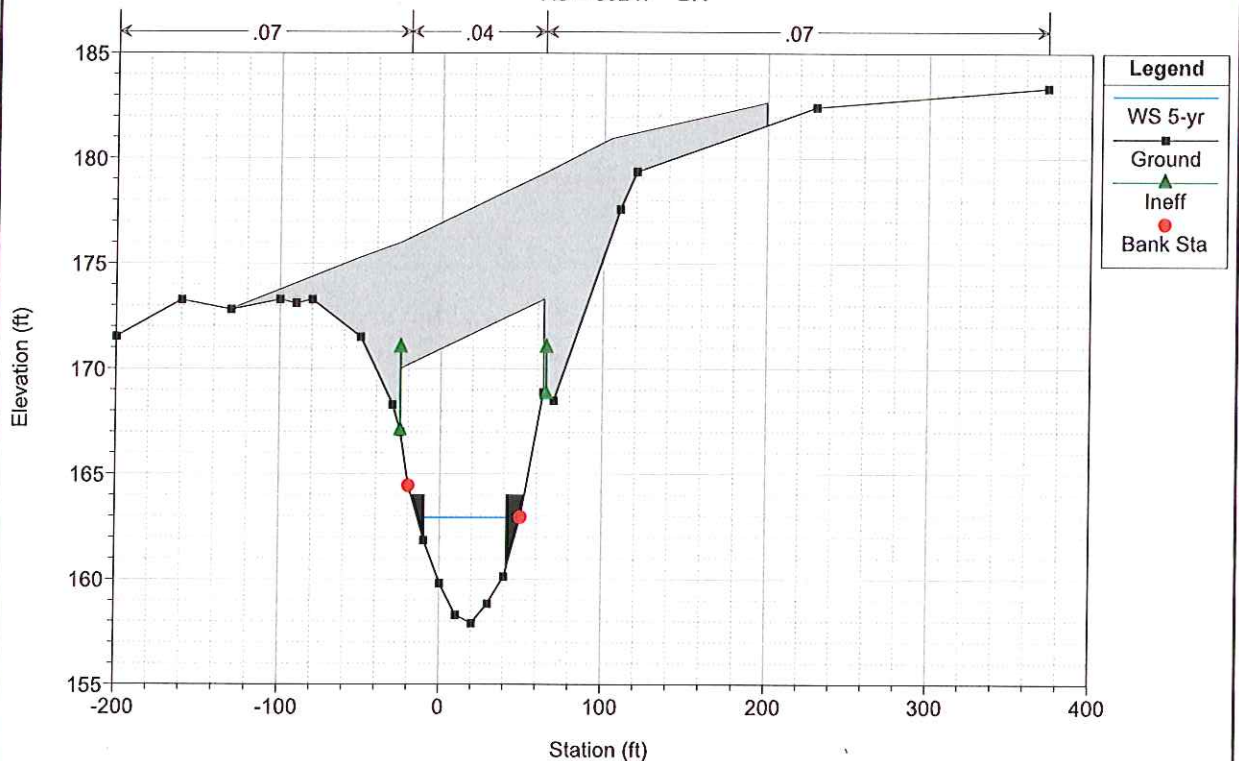
RS = 30300 CTDOT SECTION -**** Upstream of I-84 Off-Ramp

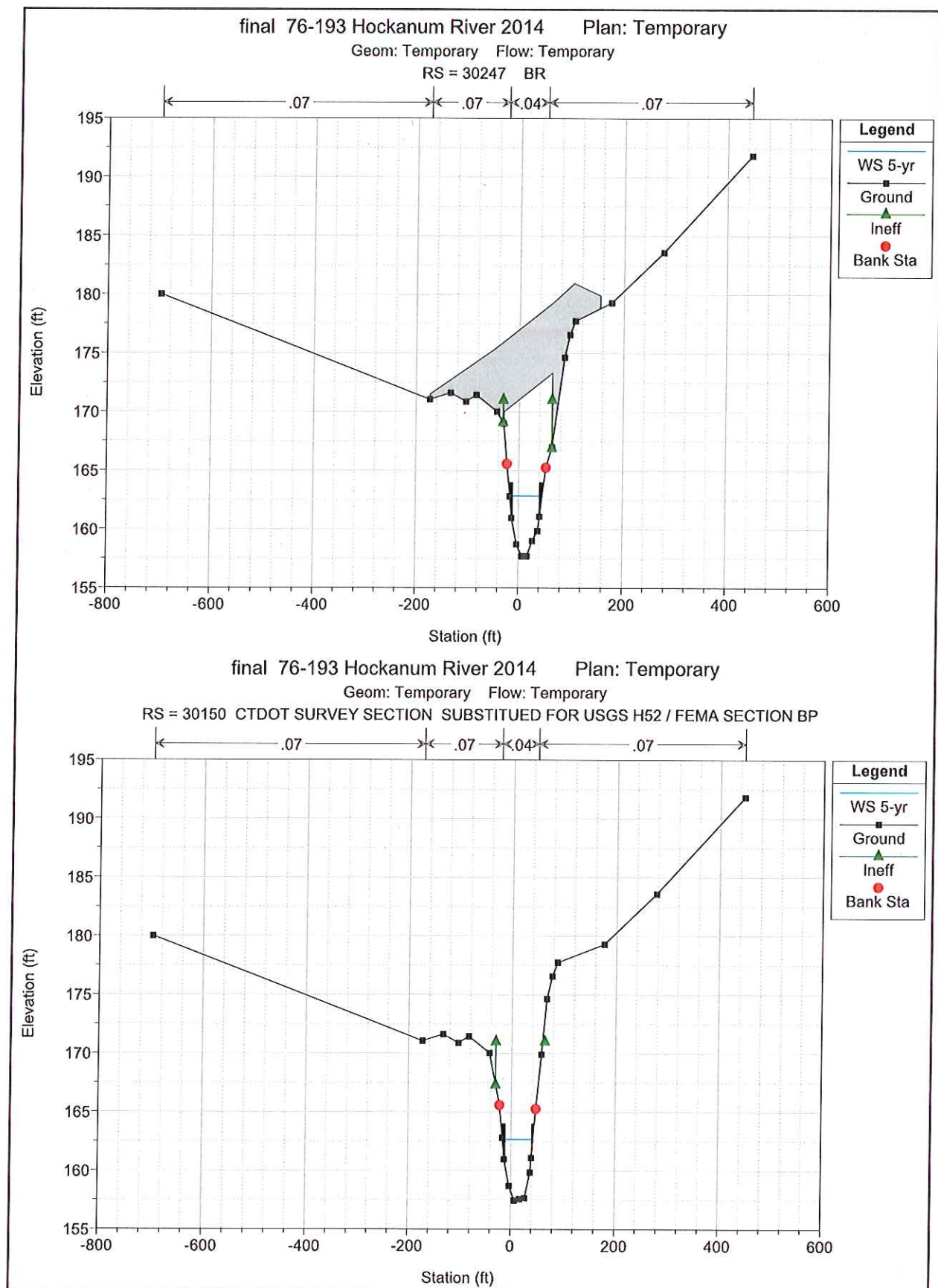


final 76-193 Hockanum River 2014 Plan: Temporary

Geom: Temporary Flow: Temporary

RS = 30247 BR





Hydrology for Temporary Facilities

PROJECT NO.: 76-193

TOWN: Manchester

UNIT: English

Prepared by: mfk

Date: 4/22/2013

Checked by:

Date:

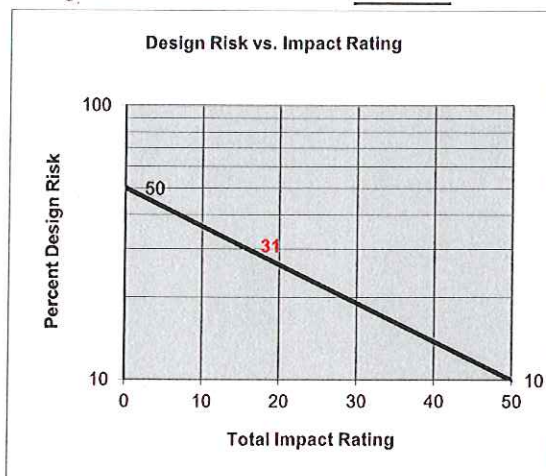
Step 1: Determine Impact Ratings

Factor	Value	Unit	Rating	Description
Potential Loss of Life	<input type="radio"/> Severe <input type="radio"/> Moderate <input type="radio"/> Least <input checked="" type="radio"/> Use ADT		3	<input type="checkbox"/> If inhabited structures, permanent or temporary, can be inundated or are in the path of a flood wave caused by an embankment failure, then this item will have a multiple of 15 applied. If no possibility of the above exists, then loss of life will be the same as the severity used for the A.D.T.
Property Damages	<input type="radio"/> Severe <input type="radio"/> Moderate <input checked="" type="radio"/> Least		1	<input type="checkbox"/> Private and public structures (houses, commercial, or manufacturing); appurtenances such as sewage treatment and water supply; utility structures either above or below ground, are to have a multiple of 10 applied. <input type="checkbox"/> Active cropland, parking lots, recreational areas are to have a multiple of 5 applied. All other areas shall use the severity determined by site conditions.
Traffic Interruption	0	mi-veh.	1	Includes consideration for emergency supplies and rescue; delays; alternate routes; busses; etc. Short duration flooding of a low volume roadway might be acceptable. If the duration of flooding is long (more than a day), and there is a nearby good quality alternate route, then the flooding of a higher volume highway might also be acceptable. The severity of this component is determined by the detour length multiplied by the average daily traffic projected for bi-directional travel.
Detour Length	0	mi	1	The length in miles of an emergency detour by other roads should the temporary facility fail.
Height Above Streambed	30.00	ft	3	The difference in elevation in feet between the traveled roadway and the bed of the waterway.
Drainage Area	49.00	sq. mi.	3	The total area contributing runoff to the temporary facility.
Average Daily Traffic Location:	15700 suburban	Year - 2012	3	The average amount of vehicles traveling bi-directional through the area in a 24-h period.

Factor	Rating				
	1	2	3		
Loss of Life	See Instructions			see ADT	3
Property Damage	See Instructions			N/A	1
Traffic Interruptions	< 2000	2000-4000	> 4000		1
Detour Length, km (mi)	< 8 (< 5)	8-16 (5-10)	> 16 (> 10)		1
Height Above Streambed, m (ft)	< 3 (< 10)	3-6 (11-20)	> 6 (> 20)		3
Drainage Area, ha (mi)	< 260 (< 1)	260-2600 (1-10)	> 2600 (> 10)		3
Rural ADT	< 400	400-1500	> 1500		3
Suburban ADT	< 750	750-1500	> 1500		
Urban ADT	< 1500	1500-3000	> 3000		
Total Impact Rating (sum of the above) =				15	

Step 2: Determine risk percentage

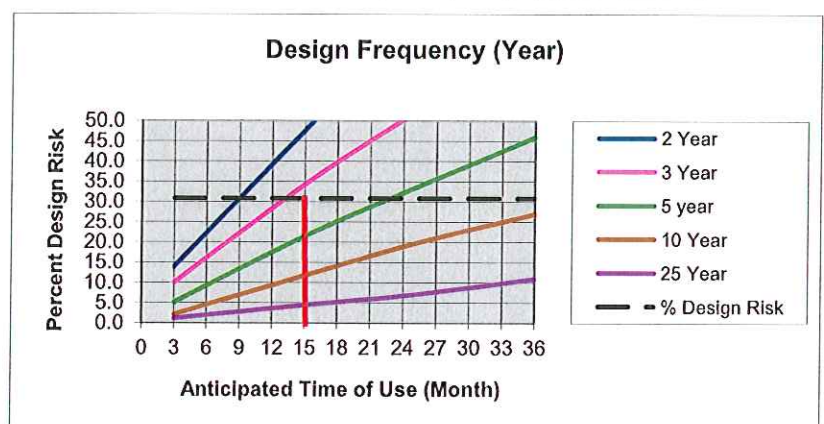
Design Risk Percent = 31



Step 3: Determine Temporary Design Frequency

Anticipated Time of Use = 15

Design Frequency = 5 Years



① Do not use the following steps if sufficient discharges have already been developed.
 Instead, the Design Discharge should be determined by plotting a frequency curve.

Step 4: Determine Multiplying Ratio

Year	Ratio	Use
2	0.8	
3	1.2	
4	1.3	
5	1.4	<==
10	1.9	
25	2.7	

Step 5: Determine Temporary Flow Rate

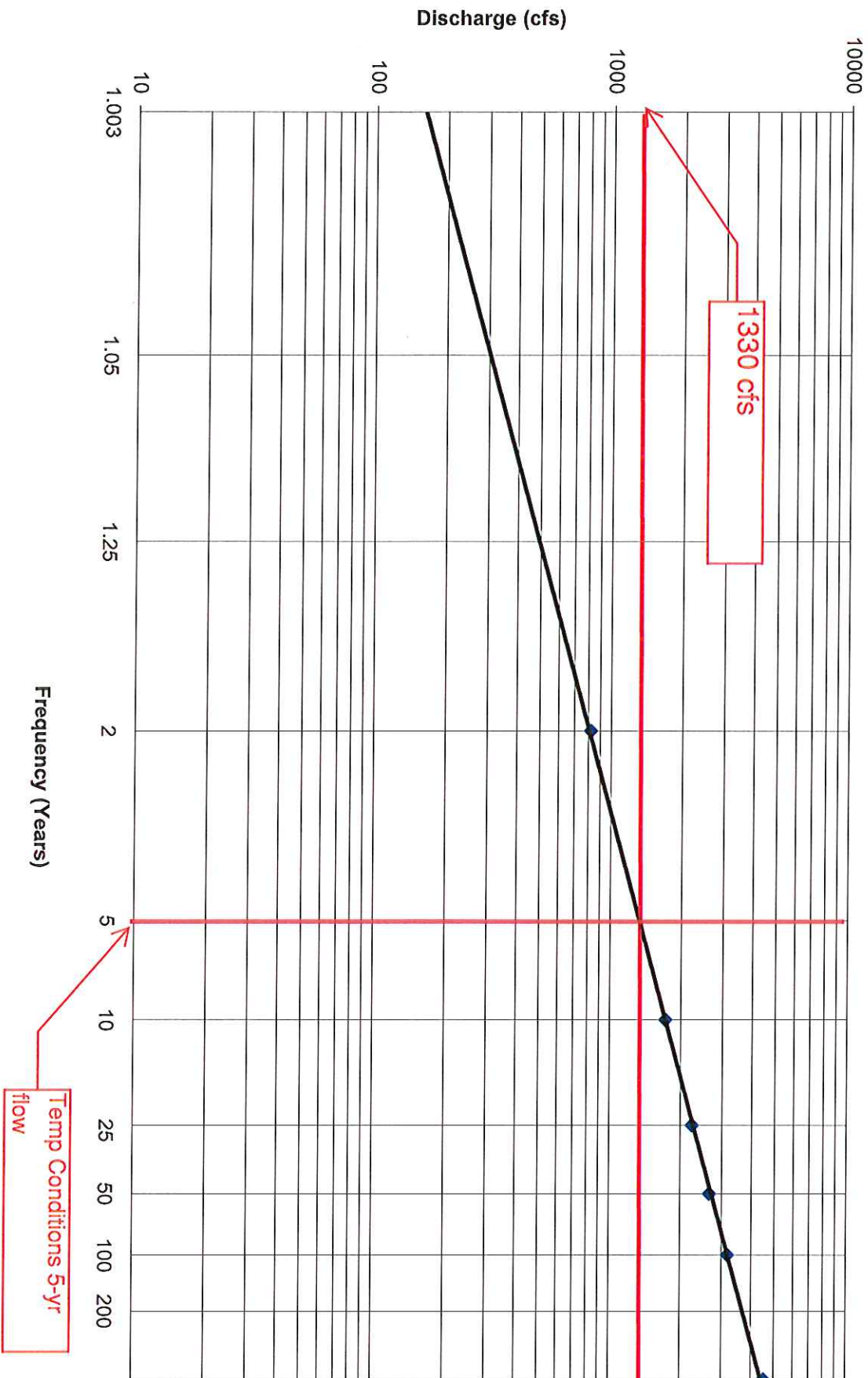
Ratio = 1.4 x 0.27 (Q₅₀ CFS) = 0.00 CFS ☹

Ratio = 1.4 x 0.20 (Q₁₀₀ CFS) = 0.00 CFS ☹

Thus, use 1330 CFS or _____ m³/s
 for the **5** year Design Discharge of the Temporary Facility

Pr. No. 76-193
Design Discharges

$$y = 810.03e^{0.5887x}$$



PROJECT NO. 76-193
I-84 Off-ramp over the Hockanum River
Manchester

AVERAGE DAILY & SPRING FLOW EQUATIONS

<u>DRAINAGE AREA</u> <u>(sq. mi.)</u>	<u>AVERAGE DAILY</u> <u>FLOW</u> <u>(cfs)</u>	<u>AVERAGE SPRING</u> <u>FLOW</u> <u>(cfs)</u>
49	84.8	164.1

$$\text{AVE. DAILY Q} = 1.87 \cdot (\text{D.A.})^{0.98}$$

$$\text{AVE. SPRING Q} = 3.62 \cdot (\text{D.A.})^{0.98}$$

Appendix

A. Site photographs

Proj. 76-193
Field Trip July 25, 2003
M. Kelley



From downstream/west side



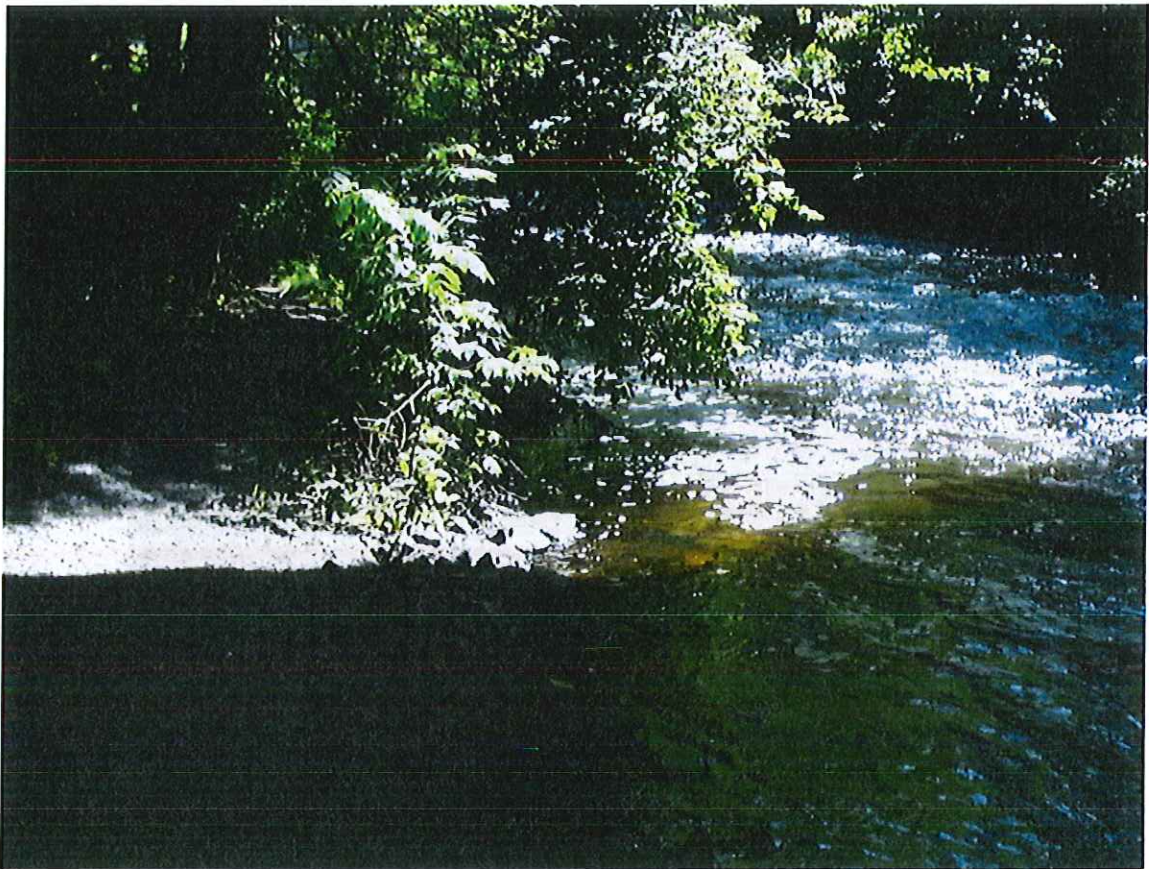
"East" abutment – flow from left to right



"West" abutment



Looking down stream



Looking up stream



"East" abutment



"East" abutment/rip rap close up 6" -8 " and up



View of trail on "East-side" going downstream – trail rises ~40' below abutment



View of trail on "East-side" going downstream – trail rises ~40' below abutment



"West "abutment – rip rap slope ~ 1.5:1 / 6" to 10" riprap

Page 1 of 1
11/11/2011
11/11/2011
11/11/2011
11/11/2011

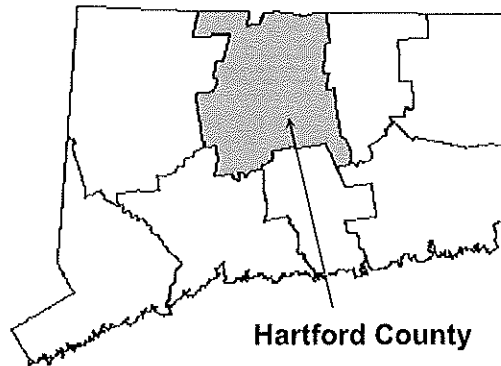
B. FEMA FIS Excerpts

FLOOD INSURANCE STUDY

VOLUME 1 OF 7



HARTFORD COUNTY, CONNECTICUT (ALL JURISDICTIONS)



Hartford County

COMMUNITY NAME	COMMUNITY NUMBER
AVON, TOWN OF	090021
BERLIN, TOWN OF	090022
BLOOMFIELD, TOWN OF	090122
BRISTOL, CITY OF	090023
BURLINGTON, TOWN OF	090145
CANTON, TOWN OF	090135
EAST GRANBY, TOWN OF	090025
EAST HARTFORD, TOWN OF	090026
EAST WINDSOR, TOWN OF	090027
ENFIELD, TOWN OF	090028
FARMINGTON, TOWN OF	090029
GLASTONBURY, TOWN OF	090124
GRANBY, TOWN OF	090125
HARTFORD, CITY OF	095080
HARTLAND, TOWN OF	090146

COMMUNITY NAME	COMMUNITY NUMBER
MANCHESTER, TOWN OF	090031
MARLBOROUGH, TOWN OF	090148
NEW BRITAIN, CITY OF	090032
NEWINGTON, TOWN OF	090033
PLAINVILLE, TOWN OF	090034
ROCKY HILL, TOWN OF	090142
SIMSBURY, TOWN OF	090035
SOUTH WINDSOR, TOWN OF	090036
SOUTHINGTON, TOWN OF	090037
SUFFIELD, TOWN OF	090038
WEST HARTFORD, TOWN OF	095082
WETHERSFIELD, TOWN OF	090040
WINDSOR, TOWN OF	090041
WINDSOR LOCKS, TOWN OF	090042

EFFECTIVE:
SEPTEMBER 26, 2008

REVISED
SEPTEMBER 16, 2011



Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
09001CV001B

Manchester, Town of:

The USGS conducted the original hydrologic and hydraulic analyses for the Hockanum River, Bigelow Brook, Hop Brook, Porter Brook, Folly Brook, Lydall Brook, Wilson Brook, South Branch Lydall Brook, Globe Hollow Brook, Birch Mountain Brook, and Avery Brook in the Town of Manchester. Those analyses were prepared for FEMA under Inter-Agency Agreement No. IAA-H-876, Project Order No. 6. That work was completed in September 1978 and was revised in June 1983. Roald Haestad, Inc., revised the analyses for FEMA under Contract No. EHW-88-C-2628. That work was completed in July 1989. Roald Haestad, Inc., revised the analyses for Hop Brook for FEMA under Contract No. EMW-90-C-3126. That work was completed in January 1992.

Marlborough, Town of:

The USGS conducted the original hydrologic and hydraulic analyses for the Town of Marlborough. Those analyses were prepared for FEMA under Inter-Agency Agreement No. IAA-H-14-78, Project Order No. 17. That work was completed in March 1980. USGS revised the hydrologic and hydraulic analyses for Fawn Brook, Fawn Hill Brook, Cattle Lot Brook, and West Branch Dickinson Creek. Those analyses were prepared for FEMA under Inter-Agency Agreement No. EMW-87-2764, Project Order No. 1. That work was completed in December 1990. USGS revised the hydrologic and hydraulic analyses for the upper reach of Blackledge River, Fawn Brook, and the Unnamed Tributary of Dickinson Creek. Those analyses were prepared for FEMA under Inter-Agency Agreement No. EMW-99-IA-0163, Project Order No. 1. That work was completed in September 2000.

New Britain, City of:

The USGS conducted the original hydrologic and hydraulic analyses for the City of New Britain. Those analyses were prepared for FEMA under Inter-Agency Agreement No. IAA-H-8-76, Project Order

TABLE 10 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
HATCHERY BROOK					
At mouth	2.44	*	*	400	*
Upstream of Lion's Club dam	1.58	*	*	300	*
HAWLEY BROOK					
At confluence with Farmington River	1.05	125	260	330	660
HAYDEN STATION BROOK					
At confluence with Connecticut River	1.02	155	330	440	795
Above confluence with Tributary D	0.54	115	205	260	400
HILLS POND BRANCH					
At confluence with Porter Brook	1.50	259	519	675	1,225
HOCKANUM RIVER					
At confluence with Connecticut River	76.10	2,070	3,830	4,870	8,080
First dam downstream of Scotland Road	74.50	2,030	3,750	4,770	7,910
At downstream Manchester corporate limits	73.40	2,000	3,700	4,700	7,800
Upstream of the confluence of Hop Brook (Town of Manchester)	60.20	1,700	3,050	3,900	6,600
Upstream of the confluence of Bigelow Brook	56.10	1,550	2,700	3,400	5,800
At upstream Manchester corporate limits	45.30	1,300	2,300	2,900	5,000
HOLLAND BROOK					
Confluence with Meadow Drain Brook	1.30	205	365	450	715
Cross section F	0.85	175	300	390	600
HOP BROOK (TOWN OF MANCHESTER)					
At confluence with Hockanum River	12.00	1,130	2,070	2,440	3,450
Upstream of confluence of Folly Brook	9.43	870	1,610	1,890	2,640

*Data not available

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE ¹	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Hockanum River (continued)								
BA	21,120	95	606	5.61	106.3	106.3	106.3	0.0
BB	21,750	107	668	5.09	107.9	107.9	107.9	0.0
BC	21,900	59	386	8.80	108.3	108.3	108.3	0.0
BD	22,580	119	529	6.42	112.3	112.3	112.3	0.0
BE	23,330	93	500	6.80	116.1	116.1	116.1	0.0
BF	23,880	228	968	3.51	118.5	118.5	118.5	0.0
BG	24,690	110	477	7.13	120.9	120.9	120.9	0.0
BH	25,130	630	8,617	0.39	144.2	144.2	145.2	1.0
BI	26,240	810	9,959	0.29	144.2	144.2	145.2	1.0
BJ	27,830	316	2,516	1.15	144.2	144.2	145.2	1.0
BK	28,420	343	958	3.03	144.4	144.4	145.3	0.9
BL	28,820	54	319	9.08	146.2	146.2	146.2	0.0
BM	29,150	77	470	6.17	148.4	148.4	148.4	0.0
BN	29,550	66	257	11.30	155.2	155.2	155.2	0.0
BO	30,060	67	317	9.15	162.5	162.5	162.5	0.0
BP	30,150	79	410	7.07	164.4	164.4	164.4	0.0
BQ	30,900	205	839	3.46	166.8	166.8	167.1	0.3
BR	31,550	127	497	5.84	167.9	167.9	168.6	0.7
BS	31,910	191	563	5.15	170.1	170.1	171.1	1.0
BT	32,125	199	1,069	2.71	171.1	171.1	172.1	1.0
BU	32,910	449	1,810	1.60	171.6	171.6	172.6	1.0
BV	33,750	265	634	4.58	172.4	172.4	173.4	1.0
BW	34,360	214	826	3.51	174.7	174.7	175.5	0.8

¹Feet above Town of Manchester corporate limits

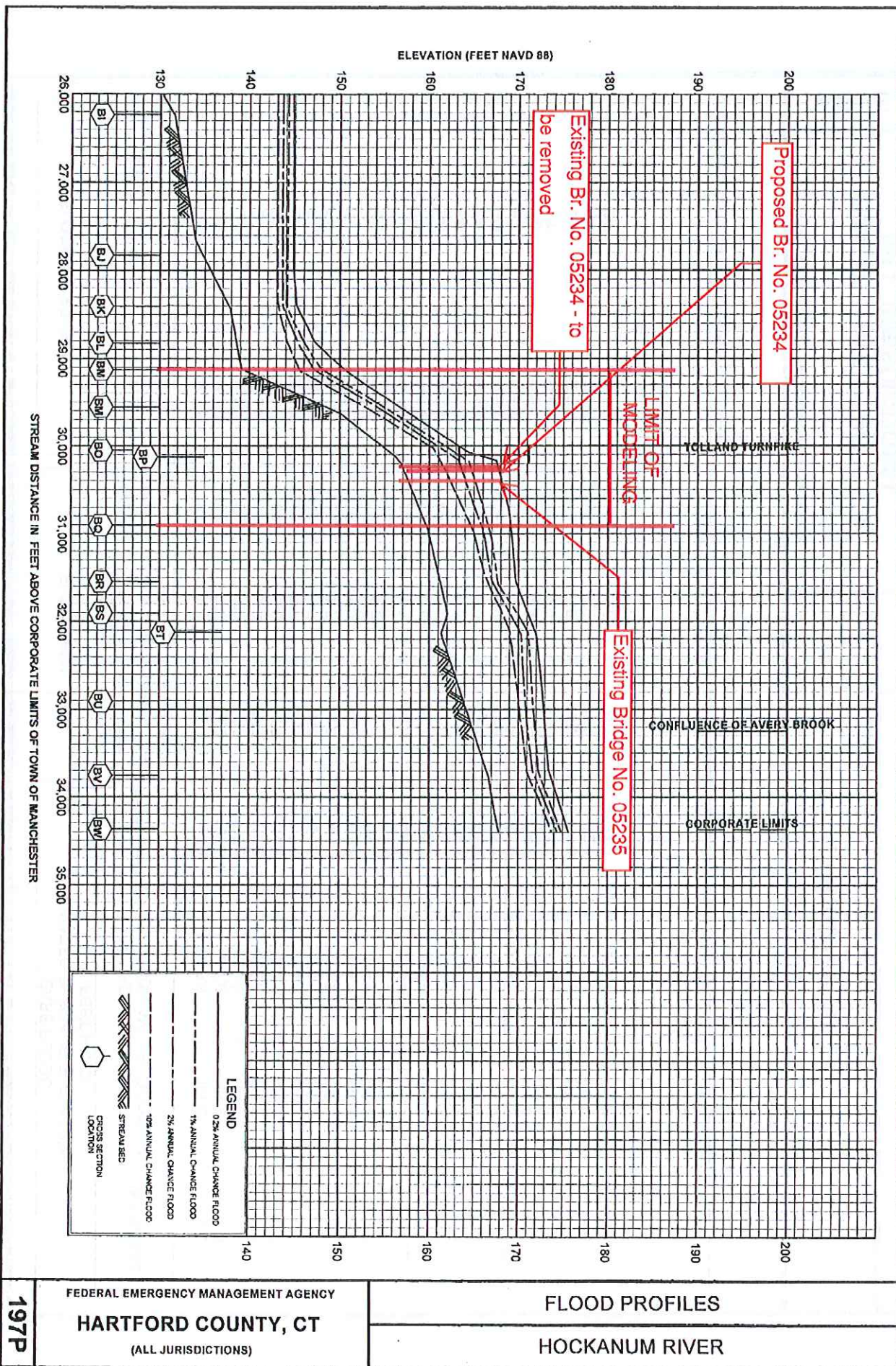
TABLE 16

FEDERAL EMERGENCY MANAGEMENT AGENCY

HARTFORD COUNTY, CT
(ALL JURISDICTIONS)

FLOODWAY DATA

HOCKANUM RIVER



1065000 FT



7

MEP

7

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

C. Hydrology

Project 76-193
Hydrologic Analysis Report
for the
Proposed Improvements on
I-84 Exit 63 EB Off-Ramp
and
Intersection of Routes 30 & 83

(Br. No. 05234 and 05238
Over the Hockanum River)
Town of Manchester

Prepared by the
CTDOT Hydraulics and Drainage Section
August 2013
(Rev. January 2014)

Table of Contents

Executive Summary

Section I

Location Maps & Figures

- Project Location
- Schematic Site Plan
- USGS Quad with delineated Drainage Area
- FEMA Flood Insurance Map Excerpt

Section II

Hydrologic Evaluation Narrative

- Project Description
- Design Discharges
- FEMA Flood Insurance Study Discharges
- Conclusions

Appendices

- A. Site photographs
- B. StreamStats Output & Miscellany
- D. FEMA FIS Excerpts

Project No 76-193
Hydrologic Study for the
Proposed Improvements on the I-84 Exit 63 EB Off-Ramp
and the
Intersection of Routes 30 & 83
(Br. No. 05234 and 05238 over the Hockanum River)
Town of Manchester

Executive Summary

Proposed project No. 76-193 is located in Manchester at the Intersection of the I-84 eastbound Exit 63 Off-ramp and Routes 30 and 83. The intent of this project is to improve the operation and safety where Routes 30 and 83 intersect with the I-84 Exit 63 On/ Off-ramp. Within the project limits there are three existing bridges that carry state roadways over the Hockanum River. There is a FEMA Flood Hazard Zone AE; and a FEMA Floodway associated with this portion of the Hockanum River. The proposed project will remove existing Br. No. 05234 which carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. A new structure will be built immediately upstream of the existing Br. No. 05234 to carry the proposed realigned Exit 63 Off-Ramp over the river. Bridge No. 05238 which carries Route 30 over the Hockanum River will have its deck structure slightly modified to allow reconfiguring the lanes however the hydraulics of the existing structure will not be impacted. Bridge No. 05235 which carries the existing I-84 Exit 63 On-Ramp over the Hockanum River will not be hydraulically impacted by the proposed project.

At this time it is anticipated that Flood Management Certification will be required for this project due to temporary impacts. Two sets of discharges were developed to satisfy the design and regulatory requirements of this project; FEMA peak discharges and the "Design" discharges.

The peak discharges for the Hockanum River for the "Design" of the replacement Br. No. 05234 structure were determined by adjusting Streamstats generated discharges based on the ratio of gaged flow to Streamstats estimated flows at a downstream Streamgage station. The Design discharges are presented in the following table.

Table 1. Design Discharges

Peak Discharges (cfs)					
2-yr	10-yr	25-yr	50-yr	100-yr	500-yr
820	1720	2240	2660	3180	4520

The FEMA discharges were obtained from the FEMA Flood Insurance Study for Hartford County, revised September 16, 2011. Existing Bridge No. 05234 is approximately 4300ft downstream from the corporate limit of the Town of Manchester and the Town of Vernon. FIS discharge data compiled for this corporate limit was used for the analysis. According to the FEMA FIS, The drainage area to the subject site is 45.3 sq. mi². Table 2 presents the FIS Peak Discharges evaluated for this project.

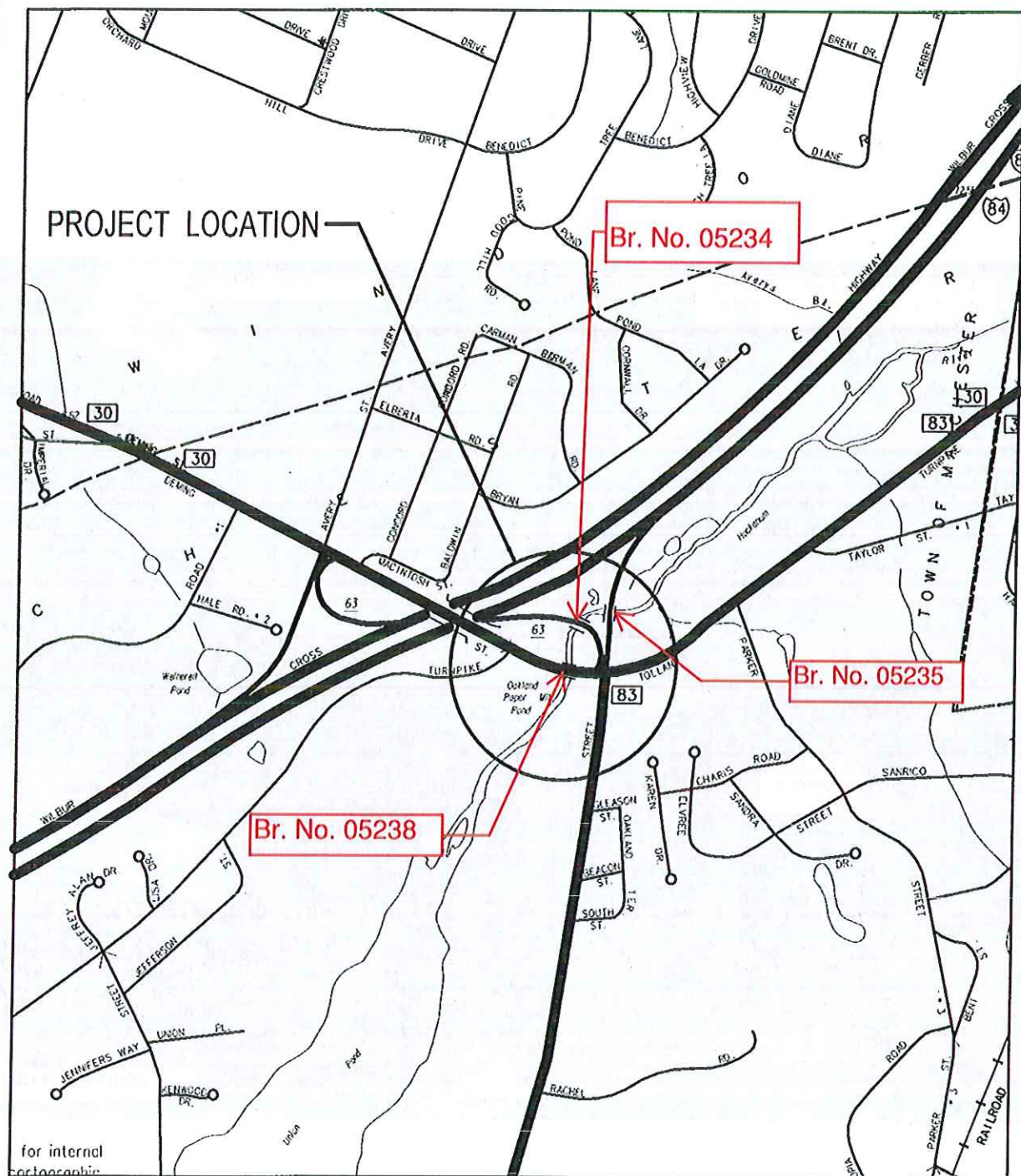
Table 2. FIS Peak Discharges

Frequency	10-year	50-year	100-year	500-year
Discharge (cfs)	1,300	2,300	2,900	5,000

The "Design" discharges were evaluated using the HEC-RAS hydraulic model as part of the hydraulic evaluation of the proposed project. Additionally, the FEMA discharges were evaluated using the HEC-RAS hydraulic models to confirm that the proposed work associated with Project 76-193 do not permanently impact the FEMA regulatory areas along the Hockanum River. At this time, it is presumed that there will be temporary impacts within the FEMA regulatory area.

Section I

Location Maps and Figures



STATE PROJECT NO.:

076-193/076-199

CITY/TOWN:

MANCHESTER CT



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
I-84 EXIT 63 OFF-RAMP &
INTERSECTION IMPROVEMENTS
ROUTE 30 @ ROUTE 83

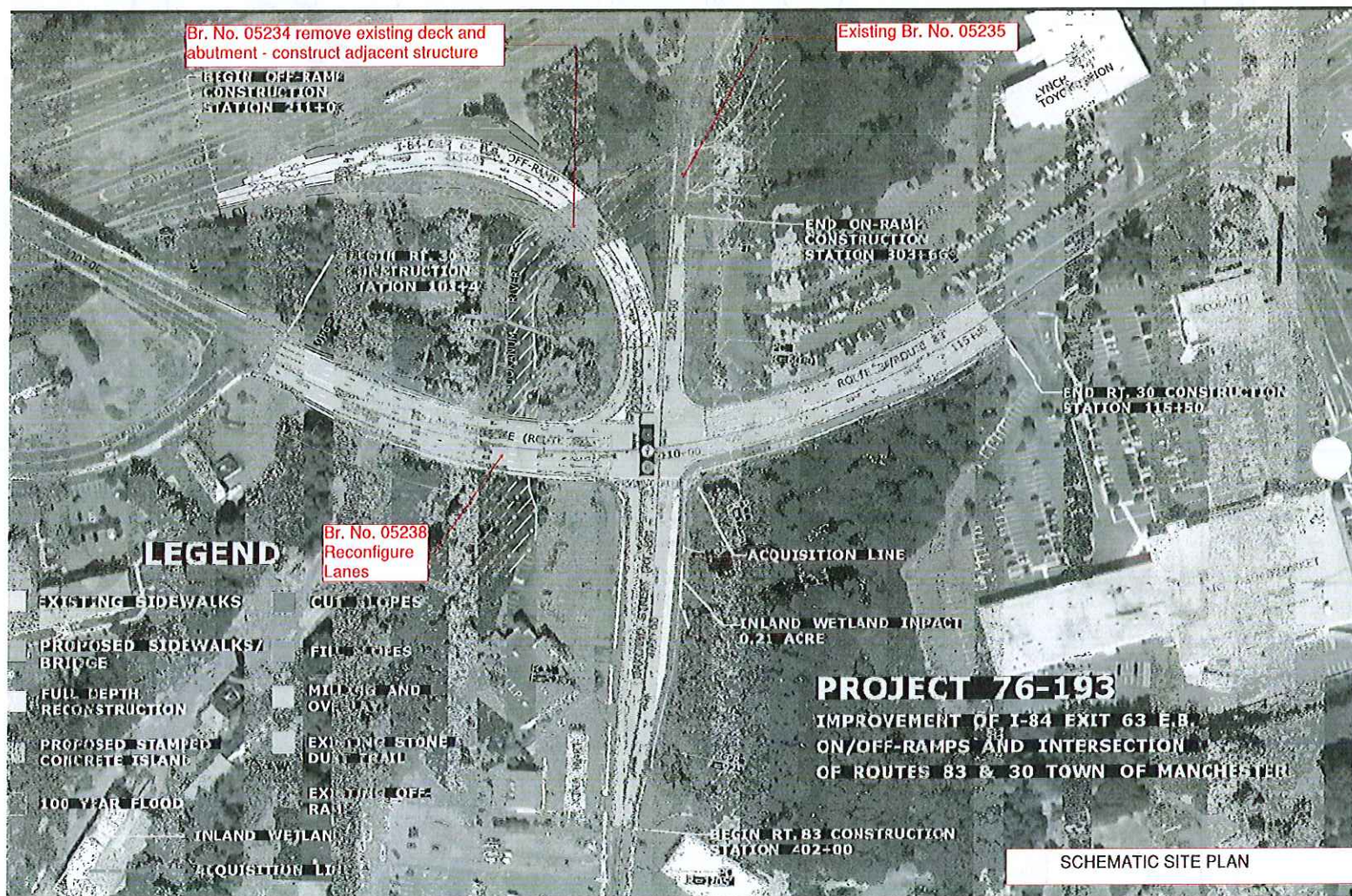


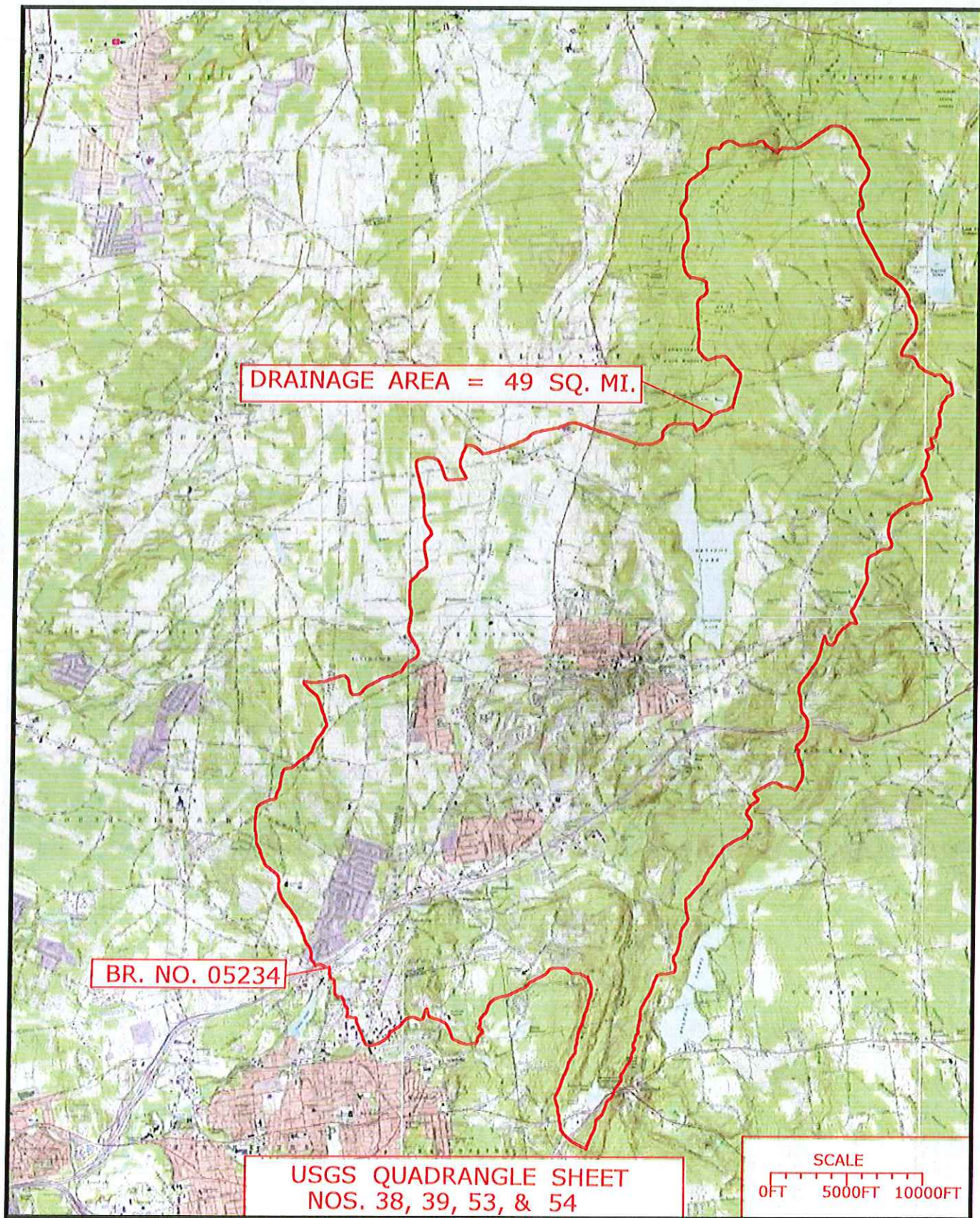
OFFICE OF
ENGINEERING



DATE:

MAY 2010





106EOM ET

ZONE AE

1

250

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100-

1000
FEET

MAP SCALE 1" = 500'

PANEL 0392F

【附】

FIRM

FLOOD INSURANCE RATE MAP
HARTFORD COUNTY,
CONNECTICUT
(ALL JURISDICTIONS)

PANEL 392 OF 675

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY

MANCHESTER

690007

4

MANCHESTER, TOWN OF

696003

4

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
09003C0392F

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Section II
Hydrologic Evaluation

Hydrologic Evaluation

Project Description

Proposed project No. 76-193 is located in Manchester at the Intersection of the I-84 eastbound Exit 63 Off-ramp and Routes 30 and 83. The intent of this project is to improve the operation and safety where Routes 30 and 83 intersect with the I-84 Exit 63 On/ Off-ramp. Within the project limits there are three existing bridges that carry state roadways over the Hockanum River. There is a FEMA Flood Hazard Zone AE; and a FEMA Floodway associated with this portion of the Hockanum River. The proposed project will remove existing Br. No. 05234 which carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. A new structure will be built immediately upstream of the existing Br. No. 05234 to carry the proposed realigned Exit 63 Off-Ramp over the river. Bridge No. 05238, which carries Route 30 over the Hockanum River, will have the deck structure slightly modified; however, the hydraulics of the existing structure will not be impacted. Bridge No. 05235, which carries the existing I-84 Exit 63 On-Ramp over the Hockanum River, will not be hydraulically impacted by the proposed project.

A full realignment and reconstruction of the Exit 63 Off-ramp is proposed. Existing Bridge No. 05234 carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. Realigning the Off-ramp will require removing the existing bridge and constructing a new structure to carry the realigned Exit Ramp. The proposed replacement for Br. No. 05234 will involve the construction of new abutments directly upstream of and generally in-line with the existing abutments. The existing northwestern abutment will be removed down to ground level. A portion of the existing southeast abutment may be incorporated into the proposed replacement structure. The existing and proposed bridge abutments are outside of the FEMA 100-yr floodplain and Floodway.

Bridge No. 05238 carries Route 30 over the Hockanum River. The bridge deck of Bridge No. 05238 will be slightly modified to allow reconfiguring the Route 30 lane alignment. The existing bridge abutments are outside of the FEMA 100-yr floodplain and Floodway.

It was determined that two of peak discharges will be required for evaluating the various potential regulatory and design impacts of this project. Adjusted Streamstats regression equation based discharges will be used for evaluating the "Design" of the replacement bridge structure. Even though the proposed and existing Br. No 05234 bridge abutments span the delineated FEMA Floodplain and Floodway; the FIS discharges will be run through the hydraulic model to confirm there are no impacts.

Design Discharges

Data from the U.S.G.S. web-based StreamStats program was used to develop the Hockanum River discharges at the Bridge No. 05234. StreamStats estimated the drainage area of the Hockanum River the Bridge No. 05234 as approximately 49 mi². A plot of the Drainage Area as delineated by StreamStats is presented in Section III of this report. As illustrated on the Drainage Area Map, less than 15% of the drainage area is designated as commercial, industrial or high-intensity residential development.

USGS stream gaging station No. 01192500 is located on the Hockanum River approximately 33600 ft. (6.4 miles) downstream of Bridge No. 05234. The period of the gage record is from 1920 to 2010. The Hockanum River has a drainage area of approximately 73.4 mi² at the stream gaging station, a drainage area ratio of 1.49 to the ungaged Bridge No. 05234 site. The 2004 USGS publication "Regression Equations for Estimating Flood flows for the 2-, 10-, 25, 100-, and 500-year Recurrence Intervals in Connecticut" presents a comparison of gaged flows at the stations and flow at the sites estimated using the regression equations. The discharges estimated by the regression equations are significantly higher than the discharges based on measured flows. It was presumed that the StreamStats estimated flows at Br. No. 05234 would be similarly higher. The "Design" discharges were determined by reducing the StreamStats regression equation estimated discharges by the same ratio as gaged flows to regression equation estimated flows at the downstream streamgage station. The following Table presents the discharges used for the Design evaluation of Br. No. 05234.

Design Flows at Br. No. 05234

Peak Discharges (cfs)					
2-yr	10-yr	25-yr	50-yr	100-yr	500-yr
820	1720	2240	2660	3180	4520

Supporting calculations are presented in the appendix.

FIS Discharges

The FEMA discharges were obtained from the FEMA Flood Insurance Study for Hartford County, revised September 16, 2011. The 2011 FEMA FIS study presents discharges at the upstream corporate limits, approximately 4,300ft (0.8miles) upstream of Br. No. 05234 and at the confluence with Bigelow Brook, approximately 14,850ft. (2.8miles) downstream of Br. No. 05234. The original detailed study of the Hockanum River was prepared by the

U. S. Geological Study (USGS) in 1978. The 1978 study utilized a statistical analysis of stream flow records covering a period of almost 50 years at the gaging station in East Hartford. The 1994 FIS revision calculated discharges for the Hockanum River using regression equations from the USGS publication Connecticut Water Resources Bulletin No. 36 Evaluation and Design of a Streamflow-Data Network for Connecticut. According to the FIS report, the 500-year peak flow was extrapolated from the 10-year to 100-year data. Data for the stream lengths and channel slopes were obtained from USGS topographic maps. Stratified Drift information was obtained from a water resources inventory of Connecticut prepared by the USGS in cooperation with the Connecticut Department of Environmental Protection (CTDEP).

The FIS discharges and Drainage areas are presented in the following Table:

FIS published Discharges

Location	Drainage Area (sq. miles)	Peak Discharges (cfs)			
		10-yr	50-yr	100-yr	500-yr
Manchester Corporate Limits	45.30	1300	2300	2900	5000
Upstream of Bigelow Brook Confluence	56.10	1550	2700	3400	5800

Excerpts from the FEMA FIS and the FEMA Mapping are included in the appendix.

The FEMA Flood Insurance Study discharges were evaluated while as part of the hydrologic evaluation of the project site. Additionally, the FEMA discharges were run in the HEC-RAS hydraulic models to confirm that the proposed work associated with Project 76-193 did not permanently impact the FEMA regulatory areas along the Hockanum River. At this time it is presumed that there will be temporary impacts within the FEMA regulatory area.

Conclusion

The "Design" discharges used to evaluate the proposed design of Br. No. 05234 are based on the StreamStats regression analysis at the Br. No. Bridge 05234 site, adjusted to account for the discrepancy between gage data at a downstream Streamgage and Streamstats generated discharges at the Streamgage site. The published FEMA discharges will be used the HEC-RAS hydraulic models developed for this project to confirm there are no adverse impact to the FEMA regulated areas.

Appendices

- A. Site photographs (see Temp Hyd. Report)
- B. StreamStats Output & Miscellany
- C. FEMA FIS Excerpts (see Temp Hyd. Report)

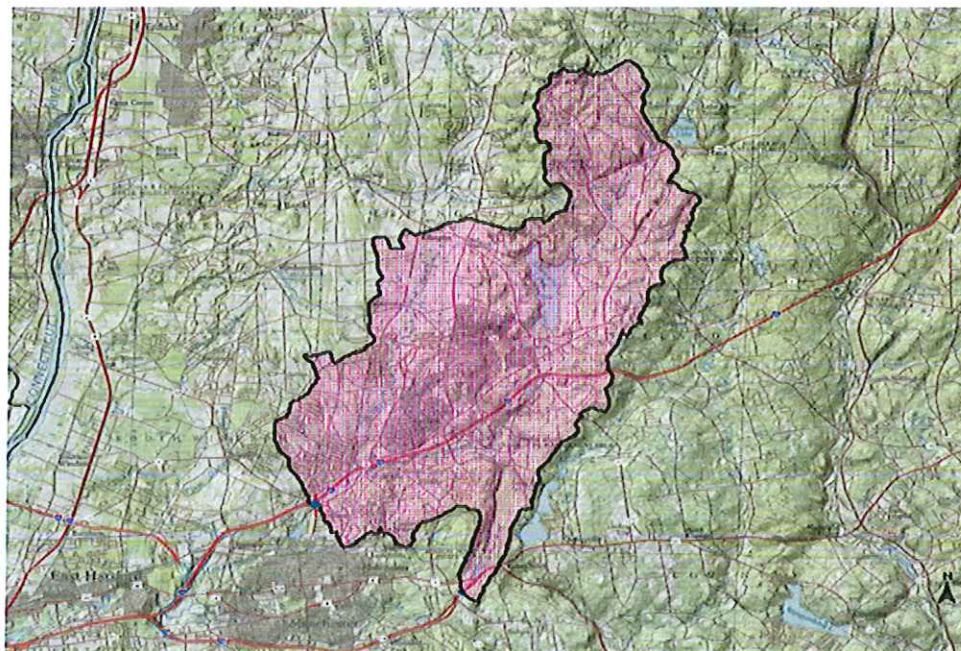
B. StreamStats Output & Miscellany



Connecticut StreamStats

Hockanum River

Pro. No. 76-193



3 1.5 0 Miles

12/13/2012 11:27:32 AM

Br. No. 05234 location

Explanation

- ◆ NHDHGage2
- ◆ NHDHDam2
- ★ GlobalWatershedPoint
- GlobalWatershed
- Stream Grid
- ▲ Gaging Station, Continuous Record
- ▲ Low Flow, Partial Record
- ▲ Peak Flow, Partial Record
- ▲ Peak and Low Flow, Partial Record
- ▲ Stage Only
- ▲ Low Flow, Partial Record, Stage
- ▲ Miscellaneous Record
- ▲ Unknown



Connecticut StreamStats

Basin Characteristics Report

Date: Thu Dec 13 2012 11:30:25 Mountain Standard Time

NAD27 Latitude: 41.8110 (41 48 40)

NAD27 Longitude: -72.5181 (-72 31 05)

NAD83 Latitude: 41.8111 (41 48 40)

NAD83 Longitude: -72.5177 (-72 31 04)

Parameter	Value
Area in square miles	49
Mean annual precipitation in the Conn River basin, in inches	48.798
24-hour, 2-year precip	3.2
24-hour, 10-year precip	4.5
24-hour, 25-year precip	5.4
24-hour, 50-year precip	6.2
24-hour, 100-year precip	7.2
Average elevation in feet	502.68
Percentage of area of coarse-grained stratified drift	24.1

Br. No. 05234 location

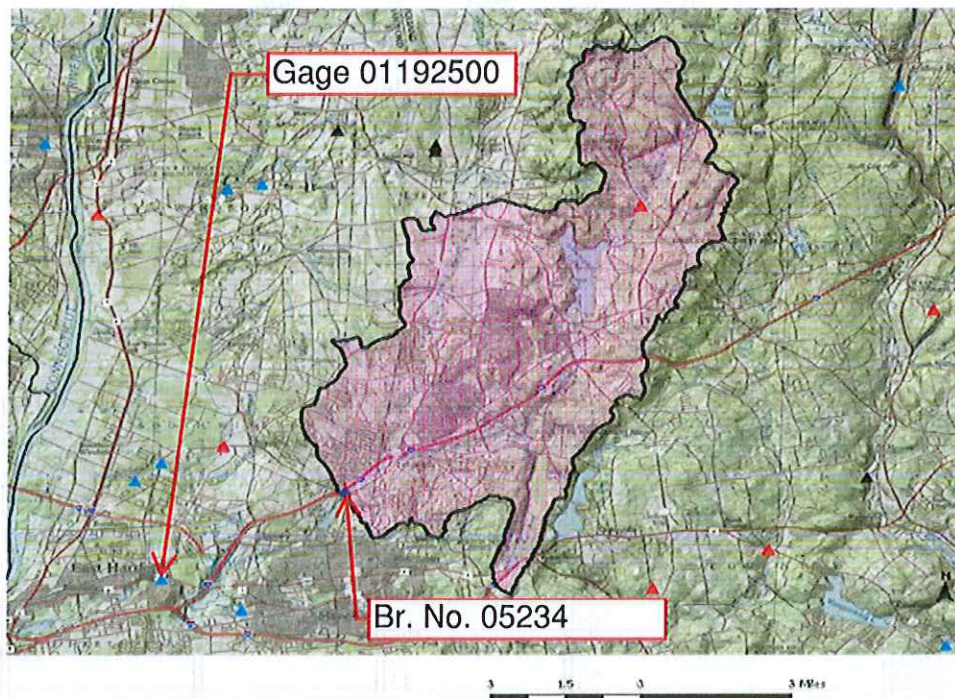
Period-of-Record Basin Characteristics			
100% Duration Flow 2010 5052 (49 mi2)			
Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	49	0.92	150
Mean November Precipitation (inches)	4.3	3.48	4.93
Percent Coarse Stratified Drift (percent)	24.1	0.1	55.1
Mean Annual Winter Precipitation (inches)	3.7	3.19	4.4
Percent Wetlands (percent)	0.9	0.3	18.1
Mean Basin Elevation (feet)	502.10	168	1287

Peak Flows Region Grid Streamflow Statistics					
Statistic	Flow (ft ³ /s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	1030	32	3.5		
PK10	2210	33	8.1		
PK25	2950	34	11		
PK50	3580	36	13		
PK100	4360	38	14		
PK500	8230	45	15		

Br. No. 05234 location

Hockanum River @ Br. No. 05234

Proj. No. 76-193



Explanation

- | | |
|------------------------|-------------------------------------|
| ◆ NHDHGage2 | ▲ Gaging Station, Continuous Record |
| ● NHDHDam2 | ▲ Low Flow, Partial Record |
| ★ GlobalWatershedPoint | ▲ Peak Flow, Partial Record |
| □ GlobalWatershed | ▲ Peak and Low Flow, Partial Record |
| ■ Stream Grid | ▲ Stage Only |
| | ▲ Low Flow, Partial Record, Stage |
| | ▲ Miscellaneous Record |
| | ▲ Unknown |

Table 9. Weighted flood-frequency estimates for selected recurrence intervals at streamflow-gaging stations in Connecticut and the flood-flow estimates derived from the regression equations and a log-Pearson Type III analysis of the annual maximum flows at the streamflow-gaging station.—Continued

[Method (for estimating flood flow): W, weighted averages; G, streamflow-gaging station log-Pearson Type III analysis; R, regression estimate. Weighted flood-frequency estimates are generally more accurate than nonweighted estimates at stations with short periods of record. Flood-flow frequency estimates are based on 10 or more years of unregulated flow record. Stations with flood control were defined as basins with usable storage of more than 4.5 million cubic feet per square mile. Flood-flow frequency values are rounded to three significant figures. mi², square miles; N, number of annual peak flows at gaging station; ft³/s, cubic feet per second; nr, near]

U.S. Geological Survey streamflow-gaging station		Drainage area (mi ²)	Period of record used in analysis	Number of flood flows (years) (N)	Method	Flood-flow frequency estimates for given recurrence interval (ft ³ /s)					
Number	Name					2 years	10 years	25 years	50 years	100 years	500 years
01189500	Salmon Brook nr Granby ⁴	66.9	1947-1963	17	W	1,880	5,240	7,940	10,500	13,600	21,400
					G	1,930	5,780	9,500	13,400	18,800	38,900
					R	1,680	4,260	6,010	7,520	9,200	10,800
01190000	Farmington River at Rainbow (flood control after 1968)	590	1928, 1936-1968	34	W	7,380	19,400	29,400	39,000	50,800	80,300
					G	7,120	18,100	27,300	36,500	48,000	87,500
					R	10,400	26,200	37,200	46,800	58,200	65,900
01190600	Wash Brook at Bloomfield	5.64	1955, 1959-1971	14	W	197	466	663	837	1,030	1,580
					G	198	476	702	921	1,190	2,100
					R	193	449	615	754	896	1,210
01191000	North Branch Park River at Hartford (flood control after 1962)	26.5	1936-1962	27	W	1,080	2,230	3,020	3,720	4,530	6,810
					G	1,150	2,460	3,430	4,330	5,400	8,760
					R	692	1,600	2,200	2,700	3,250	4,310
01192500	Hockanum River nr East Hartford	73.3	1920-1921, 1929- 2001	75	W	1,060	2,260	3,040	3,700	4,440	6,670
					G	1,050	2,200	2,940	3,550	4,220	6,040
					R	1,320	2,830	3,870	4,770	5,790	11,000
01192650	Roaring Brook at Hopewell	24.2	1962-1976	15	W	533	1,010	1,330	1,620	1,930	3,060
					G	507	852	1,060	1,240	1,430	1,960
					R	663	1,380	1,830	2,220	2,640	4,790
01192700	Mattabesset River at East Berlin	45.3	1962-1979, ⁴ 1995- 1998	22	W	1,520	2,720	3,420	4,010	4,630	5,910
					G	1,590	2,780	3,400	3,880	4,360	5,530
					R	1,140	2,550	3,470	4,240	5,080	6,510
01192883	Coginchaug River at Middlefield	29.7	⁴ 1962-1980; 1981- 2001	40	W	763	1,630	2,140	2,560	3,000	4,040
					G	747	1,550	2,010	2,370	2,750	3,690
					R	977	2,060	2,700	3,250	3,830	5,140
01193500	Salmon River nr East Hampton	101	1929-2001	73	W	2,700	6,240	8,860	11,300	14,100	23,800
					G	2,730	6,460	9,390	12,200	15,500	26,300
					R	2,200	4,550	6,010	7,270	8,700	14,500
01193800	Hemlock Valley Brook at Hadlyme	2.69	1961-1976	16	W	125	256	335	398	464	658
					G	123	245	314	368	424	563
					R	132	280	368	440	515	778

**PROJECT NO. 76-193
ADJUSTMENT OF REGRESSION DISCHARGE AT BRIDGE BASED ON
DOWNSTREAM STREAM GAGE DATA**

**HOCKANUM RIVER
Manchester**

FREQUENCY (YR)	GAGE FLOW (CFS)	REGRESSION AT GAGE (CFS)	RATIO OF GAGE FLOW/ REGRESSION FLOW	REGRESSION FLOW (STREAMSTATS) AT BR. 05234 (CFS)	*ADJUSTED REGRESSION (STREAMSTATS) FLOW AT BR. 05234 (CFS)	FEMA PEAK FLOWS (CFS)
2	1050	1320	0.7955	1030	819	
10	2200	2830	0.7774	2210	1718	1300
25	2940	3870	0.7597	2950	2241	
50	3550	4770	0.7442	3580	2664	2300
100	4220	5790	0.7288	4360	3178	2900
500	6040	11000	0.5491	8230	4519	5000

* STREAMSTATS GENERATED DISCHARGE MULTIPLIED BY RATIO OF GAGE FLOW TO REGRESSION FLOW AT GAGE TO DETERMINE ADJUSTED REGRESSION FLOW

Index to Disk Project No. 79-193 Temporary Water Handling Report

HEC-RAS Temporary Water Handling Analysis files

Summary of Project

Project: 76193final.prj
Project Title: final 76-193_Br 05234
Project Directory: g:\final HEC-RAS\

Project Plans

Plan (current)

Title: Temporary

Short ID: Temp
File: g:\final HEC-RAS\76193final.p07
Geometry: Title: Temporary
File: g:\final HEC-RAS\76193final.g02
Flow: Title: Temporary
File: g:\final HEC-RAS\76193final.f04

HEC-RAS Hydraulic Analysis "Design" Files

Plan

Title: Existing design

Short ID: Exist Design
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Geometry: Title: Existing
File: g:\final HEC-RAS\76193final.g05
Flow: Title: design
File: g:\final HEC-RAS\76193final.f03

Plan

Title: PROPOSED design

Short ID: proposed des
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Geometry: Title: PROPOSED
File: g:\final HEC-RAS\76193final.g01
Flow: Title: design
File: g:\final HEC-RAS\76193final.f03

HEC-RAS Floodway Analysis "Files

Plan

Title: EXISTING Floodway

Short ID: existing FW
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Geometry: Title: Existing
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Flow: Title: Floodway
File: g:\final HEC-RAS\76193final.f01

Plan

Title: PROPOSED Floodway

Short ID: proposed FW
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Geometry: Title: PROPOSED
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Flow: Title: Floodway
File: g:\final HEC-RAS\76193final.f01

Plan

Title: USGS AMENDED

Short ID: AMENDED
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Geometry: Title: AMENDED USGS
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Flow: Title: Floodway
File: g:\final HEC-RAS\76193final.f01

Plan

Title: USGS (CALIBRATION)

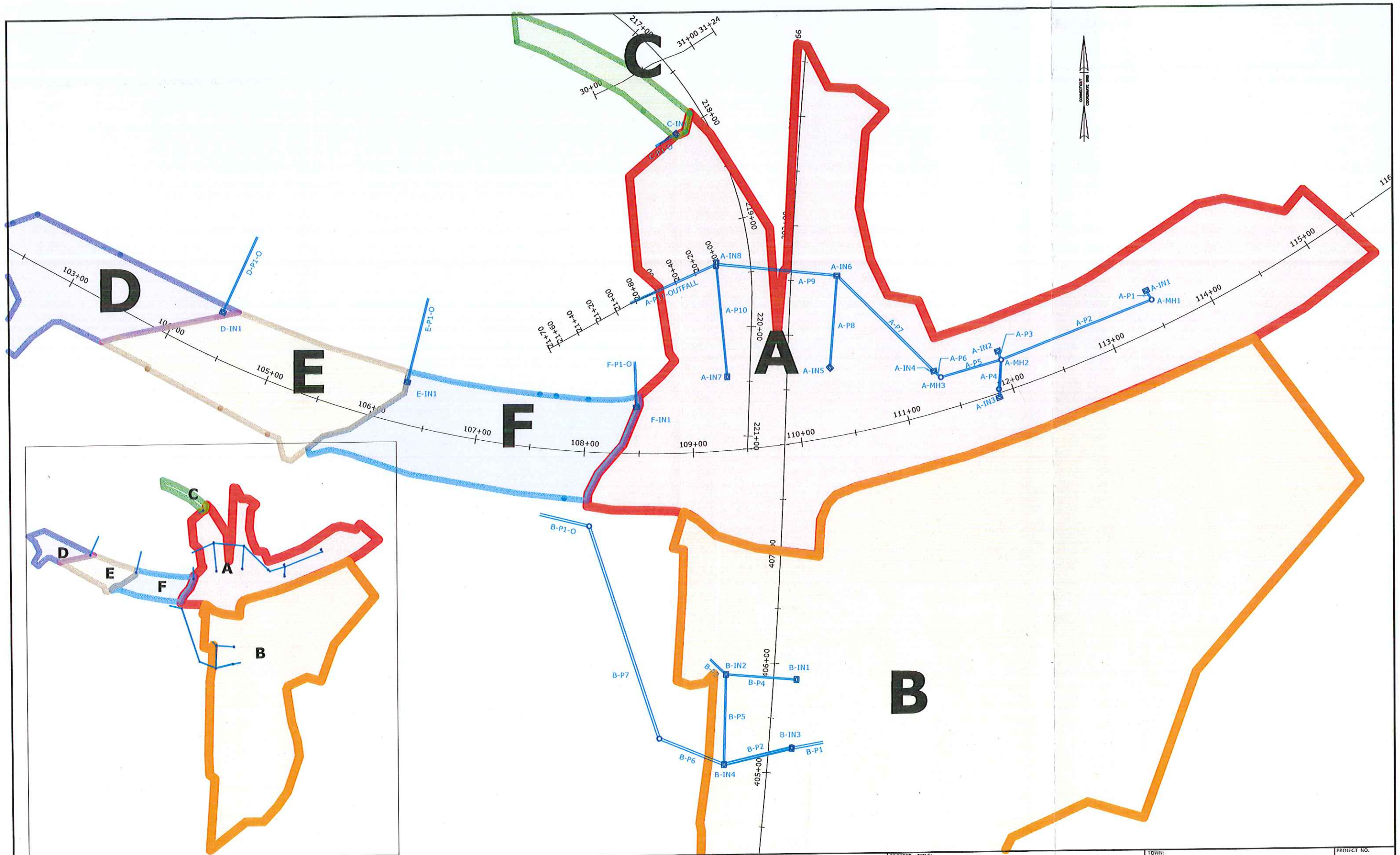
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Flow: Title: Floodway

DRAINAGE REPORT

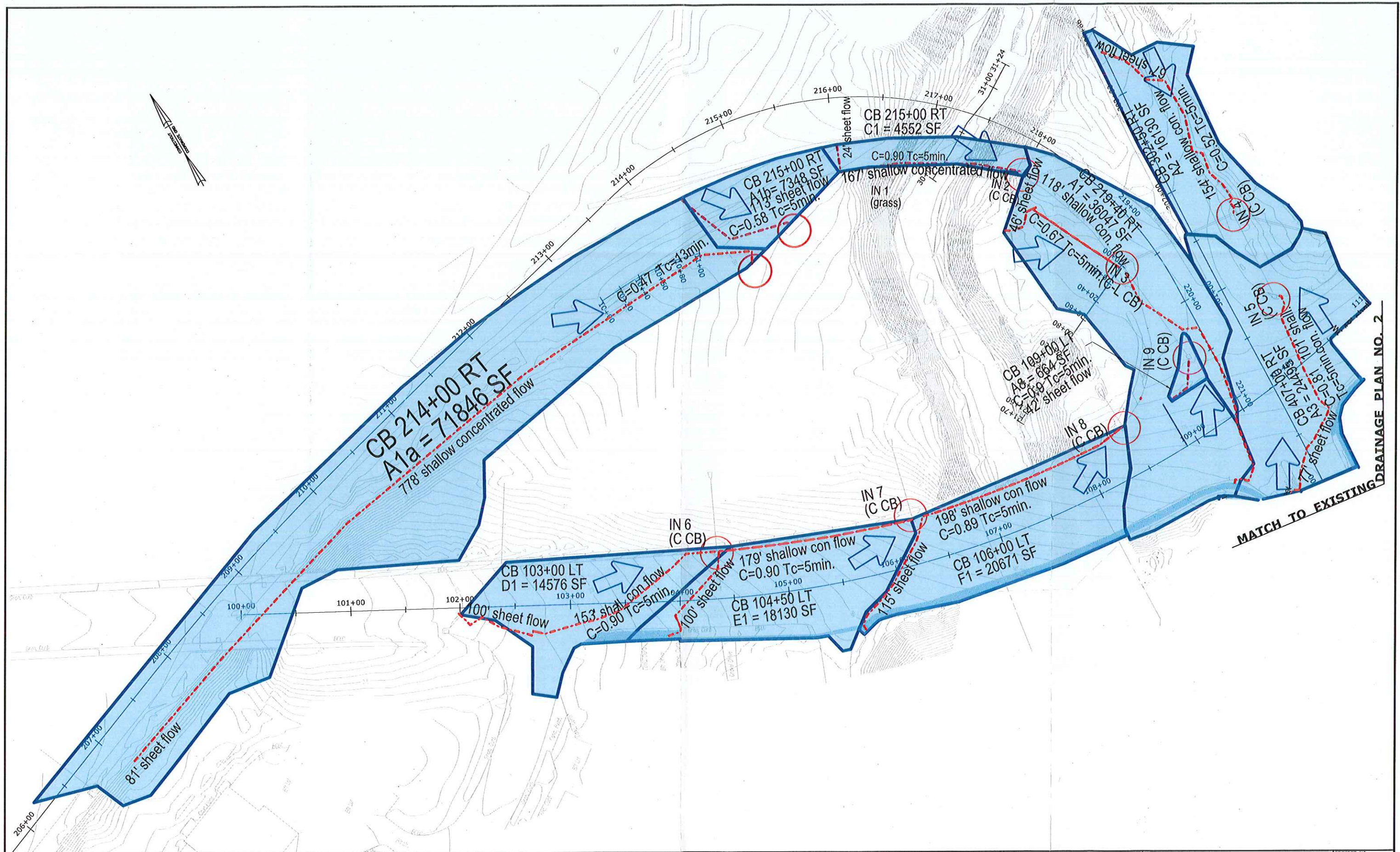
PROJECT NO:
76-193

**Proposed Improvements on
I-84 Exit 63 EB Off-Ramp
and
Intersection of Routes 30 &
83**

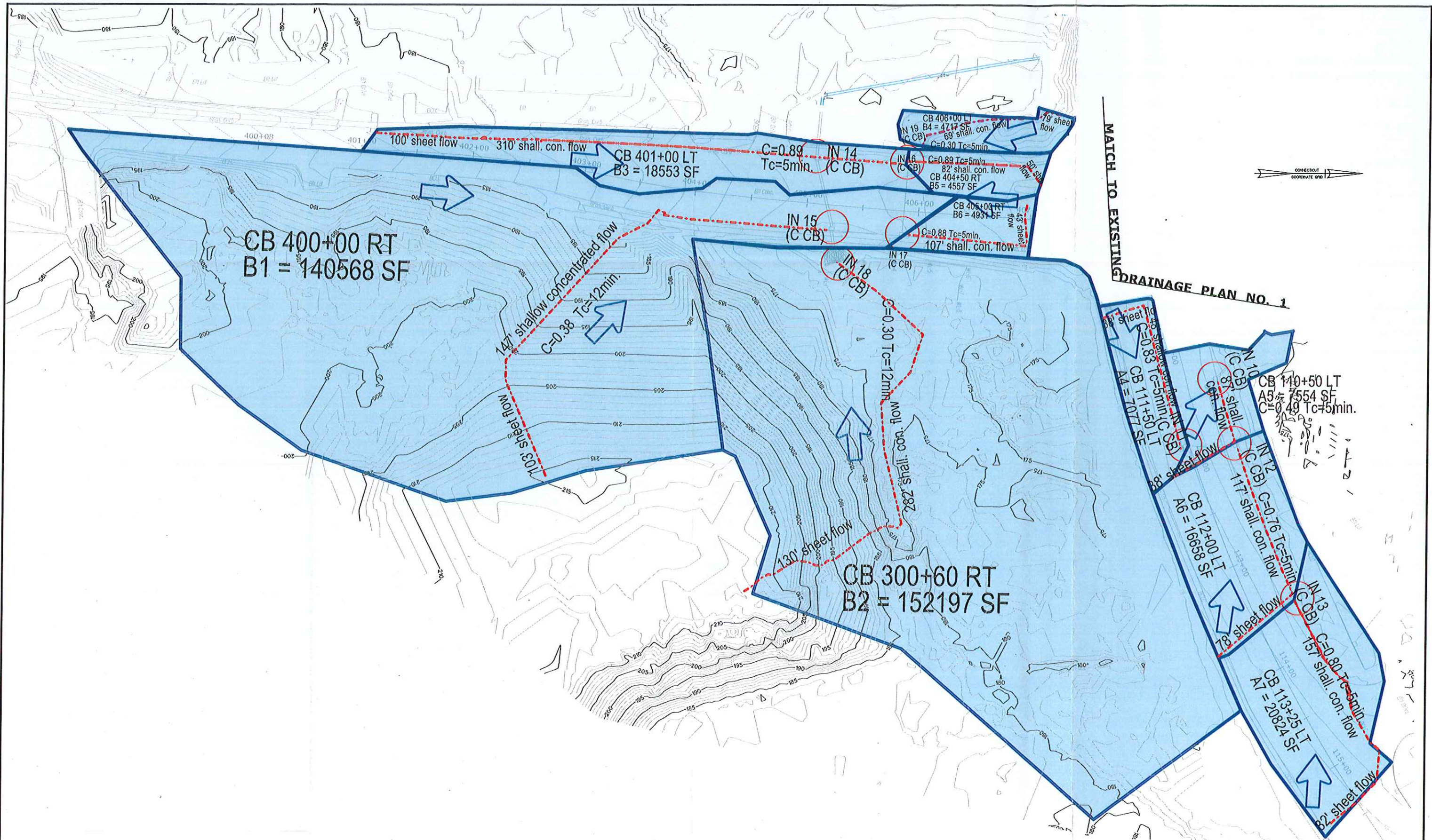
DRAINAGE DESIGN WORKSHEET		
PROJECT NO: 76-193	CITY: Manchester	DESCRIPTION: Improvement of I-84 East bound Exit 63 On and Off-Ramps and Intersection of Routes 83 & 30
DESIGNED BY: CZ	DATE: 4/11/2014	
CHECKED BY:	DATE:	
DESIGN BASIS:		
<p>1) Estimated Flow by Rational Method: (Drainage watershed area less than 200 ac) $Q = CIA$ where: C = runoff coefficient (dimensionless) I = rainfall intensity (in/hr) A = drainage area (acres)</p>		
2) Drainage Area:	Total watershed area = 13.57 acres (existing) Total watershed area = 14.28 acres (proposed)	
3) Design Standards:	<u>I-84 Eastbound Exit 63 on/off-ramps</u> Classification: Expressway/Freeway Interchange Ramps Design Speed: 65 mph ADT: (current) 15700 vpd <u>CT Route 30 and CT Route 83</u> Classification: Multi-lane Principal Urban Arterials Design Speed: 50/45 mph ADT: ≥ 16800	
4) Design Storm Frequency: ConnDOT Drainage Manual (Chp. 6 - Append. A pg. 6.A-1), (Table 11-2: Pavement Drainage Design Criteria)	10 year frequency occurrence 10 year frequency occurrence - State Collector highway with ADT > 3000	
5) Runoff Coefficients for Rational Formula: "C": (Per HEC 22, 3rd Ed. Table 3-1)	Land uses: Asphaltic Streets - (Paved) 0.900 Drives and walks 0.800 Lawns Sandy soil average slope 2 - 7%: 0.150	
6) Time of Concentration: (tc) ConnDOT Drainage Manual - Sec. 6.9.6	tc min: grassed area 10 min tc min: paved area 5 min	
7) Manning's Roughness Coefficient (n) for Overland Sheet Flow (Per HEC 22, 3rd Ed. Table 3-2)	Surface Description: Smooth asphalt 0.011 Short grass prairie 0.150 Concrete lining 0.013	
8) Manning's Roughness Coefficient (n) for Channels and Pipes (Per HEC 22 3rd Ed., Table 3-4)	BRICK 0.015 RCP 0.013 PVC 0.011 HDPE 0.011 CMP 0.022	
9) Curbing:	BCLC GC	
10) Range Constraints: Per ConnDOT Drainage Manual	Minimum Velocity: 3 ft/s (page 11.11-7) Minimum Slope: 0.0032 ft/ft (15" RCP) 0.0017 ft/ft (24" RCP)	
11) Allowable Design Spread: Per ConnDOT Drainage Manual (Table 11-2: Pavement Drainage Design Criteria)	State Arterial Highways and Expressways: Speed ≥ 50 mph: ADT ≥ 3000 Shoulder all except one lane width Sag Condition Arterial Highways: Speed ≥ 50 mph: ADT ≥ 3000 Shoulder all except one lane width Sag Condition Arterial Highways: Speed ≤ 45 mph: ADT ≥ 3000 half of lane all except one lane width Sag Condition	
12) Existing Inlet Types:	Type "C" catch basins DBL "C" Catch basins Type "CL" catch basins Storm MH	
13) Proposed Inlet Types:	Type "C" catch basins Type "CL" catch basins Storm MH	






REV. DATE REVISION DESCRIPTION SHEET NO.		THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED. Flotted Date: 1/31/2014		DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE IN FEET SCALE 1"=40' 0 40 80		STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION FILENAME: ...\\HW.DRG.0076.0193.STOPM.SAN.dgn		SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:		PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83		TOWN OF MANCHESTER DRAWING TITLE: EXISTING DRAINAGE SYS. A, B, C, D, E, & F		PROJECT NO. DRAWING NO. SHEET NO.	
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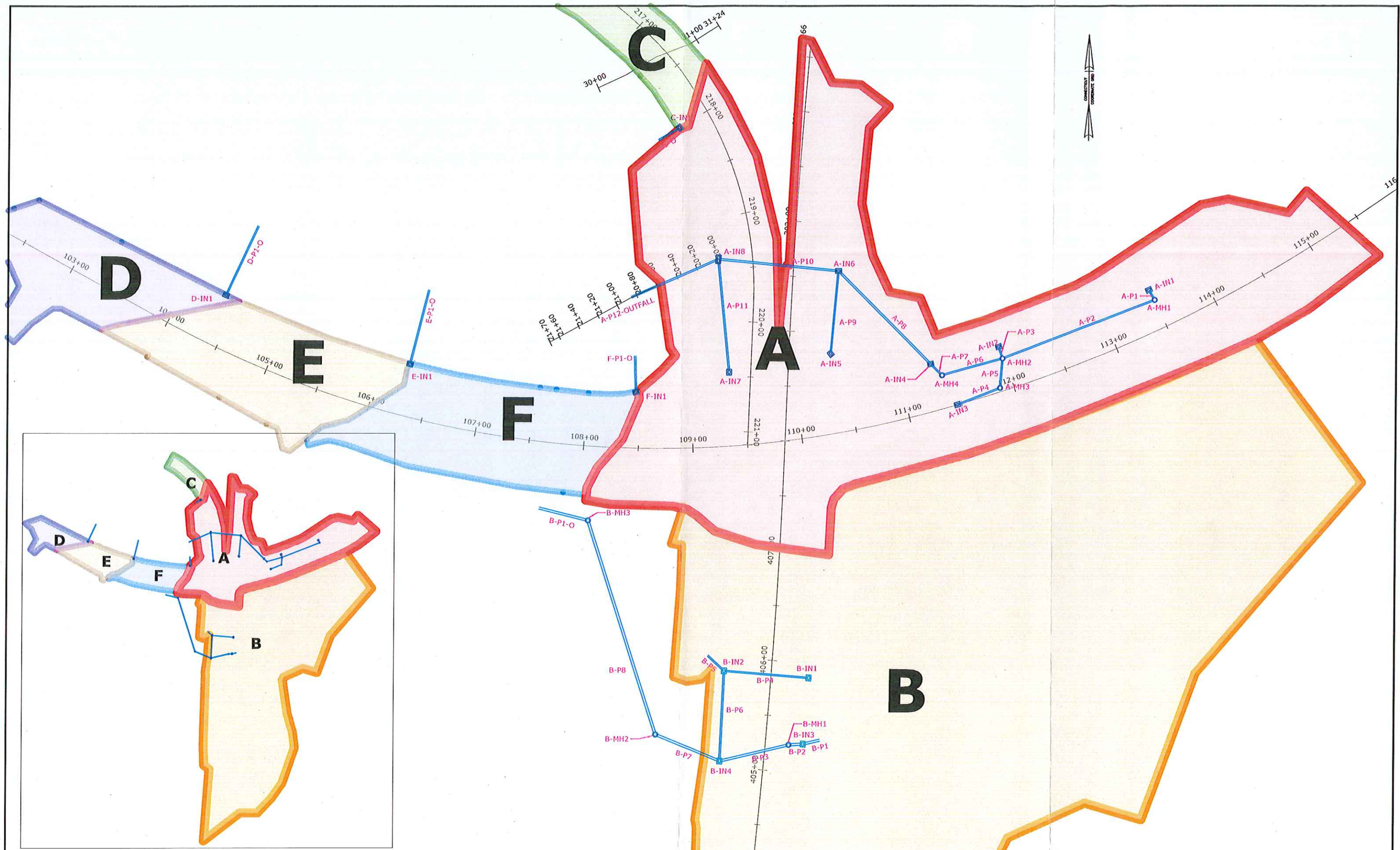


REV. DATE REVISION DESCRIPTION SHEET NO.		THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.		DESIGNER/DRAFTER: CZ CHECKED BY: MV SCALE IN FEET 0 40 80 SCALE 1"=40'		STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: ...\\HW DRG. 0076.0193. PLN. 01.dgn		SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:		PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83		TOWN: TOWN OF MANCHESTER PROJECT NO.: 76-193 DRAWING TITLE: EXISTING DRAINAGE PLAN SHEET 1		SHEET NO.	
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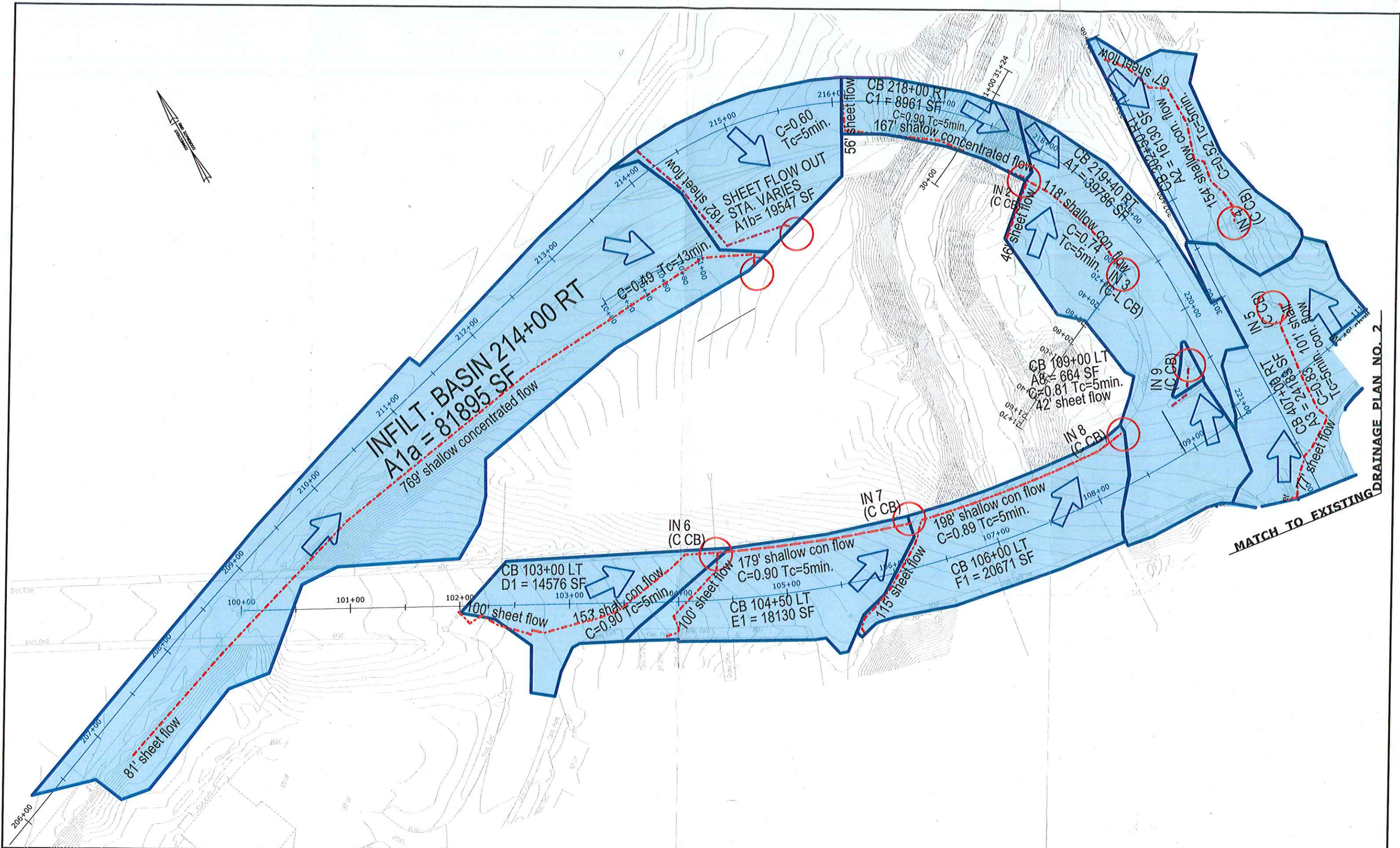



PRELIMINARY DESIGN REVIEW

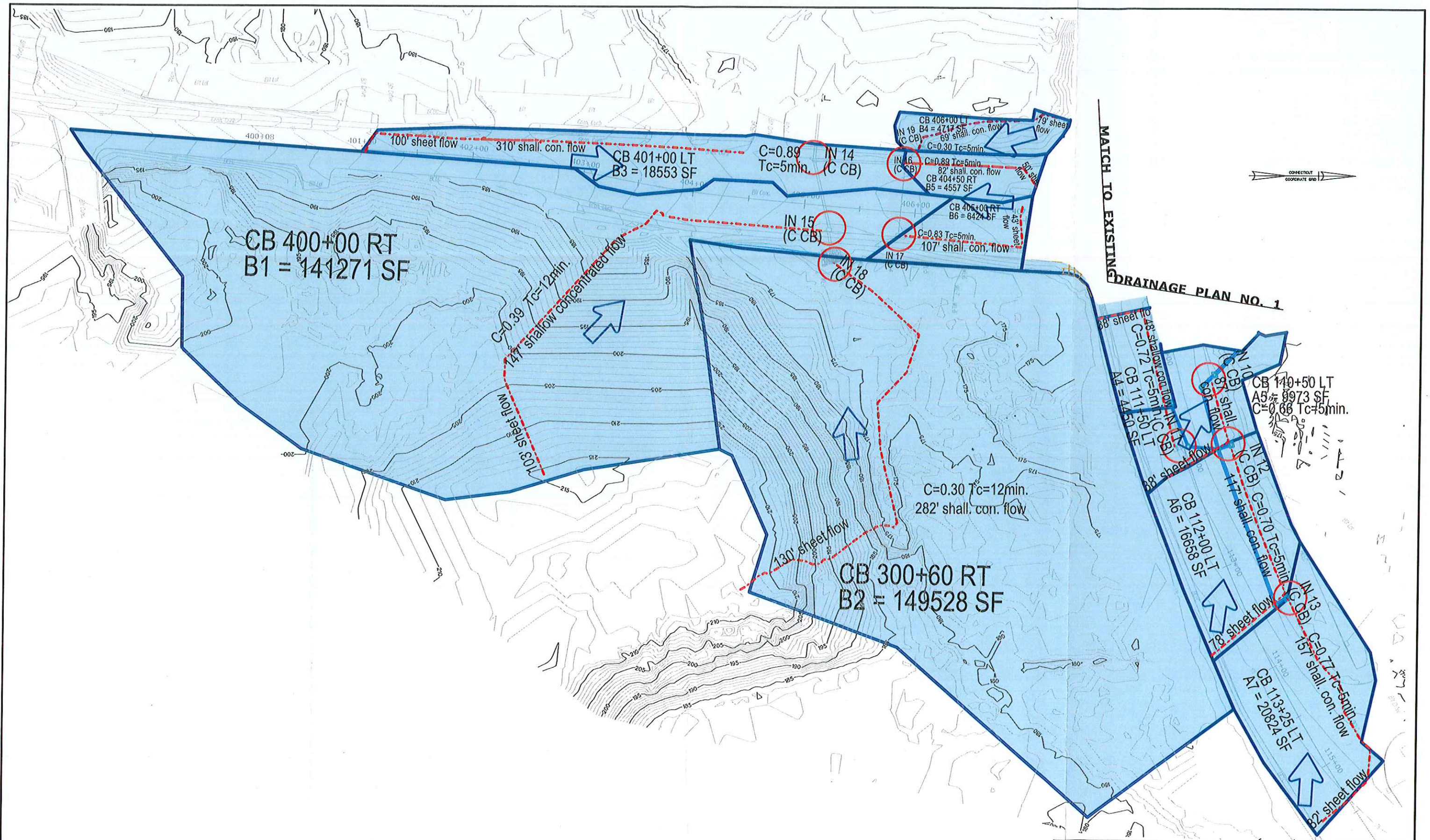
<table><tr><td>REV.</td><td>DATE</td><td>REVISION DESCRIPTION</td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>			REV.	DATE	REVISION DESCRIPTION																												<table><tr><td>DESIGNER/DRAFTER: CZ</td><td rowspan="3"></td></tr><tr><td>CHECKED BY: MV</td></tr><tr><td>THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.</td></tr></table>		DESIGNER/DRAFTER: CZ		CHECKED BY: MV	THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	<table><tr><td>SIGNATURE/ BLOCK: OFFICE OF ENGINEERING</td><td rowspan="2">IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83</td></tr><tr><td>APPROVED BY:</td></tr></table>		SIGNATURE/ BLOCK: OFFICE OF ENGINEERING	IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	APPROVED BY:	<table><tr><td>TOWN: TOWN OF MANCHESTER</td><td>PROJECT NO. 76-193</td></tr><tr><td>DRAWING TITLE: EXISTING DRAINAGE PLAN SHEET 2</td><td>DRAWING NO. </td></tr><tr><td> </td><td>SHEET NO. </td></tr></table>		TOWN: TOWN OF MANCHESTER	PROJECT NO. 76-193	DRAWING TITLE: EXISTING DRAINAGE PLAN SHEET 2	DRAWING NO. 		SHEET NO.
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Time of Concentration Calculations

EXISTING

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **GZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN1a**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L < 150 ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Grass)
2.Short Grass Prairie
0.15
81
3.2
0.034
0.111

N/A
0
0
0
0.000
0.000

+

=

0.111 hr.
6.664 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Grass)
Unpaved
778
0.016
2.041
0.106

N/A
0
0.000
0.000
0.000

+

=

0.106 hr.
6.353 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

=

0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

13 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN1b**

Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (paved)
1. Smooth
0.011
100
3.2
0.034
0.016

8. Grasses
0.24
13
3.2
0.060
0.030

+

= **0.046 hr.**
2.773 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

Unpaved
0.016
0.000
0.000

+

N/A
0
0.000
0.000

= **0.000 hr.**
0.000 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

3 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN2**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1.Smooth
0.011
24
3.2
0.042
0.005

N/A
0
0
0
0.000

+

= 0.005 hr.
0.289 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC Paved
Paved
167
0.033
3.693
0.013

N/A
0
0.000
0.000
0.000

+

= 0.013 hr.
0.754 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN3**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Grass)
2.Short Grass Prairie
0.15
46
3.3
0.027
0.076

N/A
0
0
0
0.000
0.000

+

= **0.076 hr.**
4.571 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (paved)
Paved
118
0.031
3.562
0.009

N/A
0
0.000
0.000
0.000

+

= **0.009 hr.**
0.552 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN4**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
67
3.3
0.049
0.010

N/A
0
0
0
0.000
0.000

+

= **0.010 hr.**
0.605 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Grass)
Unpaved
154
0.037
3.095
0.014

N/A
0
0.000
0.000
0.000

+

= **0.014 hr.**
0.829 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN5**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150 ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
77
3.2
0.033
0.013

N/A
0
0
0
0.000
0.000

+

= **0.013 hr.**
0.810 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
101
0.052
4.631
0.006

N/A
0
0.000
0.000
0.000

+

= **0.006 hr.**
0.363 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0
0
0

0
0
0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN6**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
100
3.3
0.016
0.022

N/A
0
0
0
0.000
0.000

+

= **0.022 hr.**
1.311 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
153
0.057
4.870
0.009

N/A
0
0.000
0.000
0.000

+

= **0.009 hr.**
0.524 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN7**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150ft).....ft
4. 2-yr 24-hr rainfall, P₂ ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)	
1. Smooth	
0.011	
100	
3.3	
0.055	
0.013	

N/A	
0	
0	
0	
0.000	
0.000	

+

= **0.013 hr.**
0.796 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)	
Paved	
179	
0.053	
4.680	
0.011	

N/A	
0	
0.000	
0.000	
0.000	

+

= **0.011 hr.**
0.637 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0	

0	

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN8**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

- Surface description (See Table 3-1)
- Manning's roughness coeff., n
- Flow length, L (total $L \leq 150$ ft).....ft
- 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
- Land slope, s ft/ft
- $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
115
3.2
0.065
0.014

N/A
0
0
0
0.000
0.000

+

= 0.014 hr.
0.846 min.

Shallow concentrated flow

Segment ID

- Surface description
- Flow length, Lft
- Watercourse slope, sft/ft
- Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
- $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
198
0.047
4.407
0.012

N/A
0
0.000
0.000
0.000

+

= 0.012 hr.
0.749 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

- Surface description / Pipe type
- Cross sectional flow area, A ft²
- Wetted perimeter, P_w ft
- Hydraulic radius, $r = \frac{A}{P_w}$ ft
- Channel slope, s ft/ft
- Manning's roughness coeff., n
- $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
- Flow length, Lft
- $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

- Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN9**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table 8-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
42
3.2
0.037
0.008

N/A
0
0
0
0.000
0.000

+

= **0.008 hr.**
0.476 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

N/A
N/A
0
0.000
0.000
0.000

N/A
N/A
0
0.000
0.000
0.000

+

= **0.000 hr.**
0.000 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0
0
0

0
0
0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

0 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN10**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1.Smooth
0.011
38
3.2
0.052
0.006

N/A
0
0
0
0.000
0.000

+

=

0.006 hr.
0.381 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
87
0.023
3.076
0.008

N/A
0
0.000
0.000
0.000

+

=

0.008 hr.
0.471 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

+

=

0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: 76-193 Designed by: CZ Date: 4/11/2014

Location: MANCHESTER Checked by: Date:

COUNTY: HARTFORD

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: IN11

Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
38
3.2
0.052
0.006

N/A
0
0
0
0.000
0.000

+

= 0.006 hr.
0.381 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
48
0.005
1.437
0.009

N/A
0
0.000
0.000
0.000

+

= 0.009 hr.
0.557 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN12**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1.Smooth
0.011
78
3.2
0.045
0.012

N/A
0
0
0
0.000
0.000

+

= **0.012 hr.**
0.718 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
117
0.013
2.300
0.014

N/A
0
0.000
0.000
0.000

+

= **0.014 hr.**
0.848 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN13**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L < 150ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
82
3.2
0.024
0.016

N/A
0
0
0
0.000
0.000

+

= 0.016 hr.
0.961 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
157
0.006
1.626
0.027

N/A
0
0.000
0.000
0.000
0.000

+

= 0.027 hr.
1.609 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

3 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
 Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN14**
 Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)	
1.Smooth	
0.011	
100	
3.2	
0.030	
0.017	

N/A	
0	
0	
0	
0.000	
0.000	

+

= **0.017 hr.**
1.030 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)	
Paved	
310	
0.026	
3.286	
0.026	

Paved	
0	
0.000	
0.000	
0.000	

+

= **0.026 hr.**
1.572 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0	

0	

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

3 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN15**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L < 150ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{0.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Grass)
9.Lt. Woods
0.4
103
3.2
0.131
0.173

N/A
0
0
0
0.000
0.000

+ = 0.173 hr.
10.368 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Grass)
Unpaved
147
0.153
6.311
0.006

CD (Grass)
Unpaved
202
0.041
3.247
0.017

+ = 0.024 hr.
1.425 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

+ = 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) 12 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN16**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)	
1. Smooth	
0.011	
50	
3.2	
0.019	
0.012	

N/A	
0	
0	
0	
0.000	
0.000	

+

=

0.012 hr.
0.707 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)	
Paved	
82	
0.028	
3.402	
0.007	

N/A	
0	
0.000	
0.000	
0.000	

+

=

0.007 hr.
0.402 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0	

0	

0	

0	

0	

+

=

0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN17**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150ft).....ft
4. 2-yr 24-hr rainfall, P₂ ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1.Smooth
0.011
43
3.2
0.023
0.010

N/A
0
0
0
0.000
0.000

+

= 0.010 hr.
0.583 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
107
0.026
3.278
0.009

N/A
0
0.000
0.000
0.000

+

= 0.009 hr.
0.544 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN18**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Woods)
9.Lt. Woods
0.4
130
3.2
0.250
0.161

N/A
0
0
0
0.000
0.000

+

=

0.161 hr.
9.645 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Woods)
Unpaved
282
0.011
1.692
0.046

N/A
0
0.000
0.000
0.000

+

=

0.046 hr.
2.777 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

=

0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

12 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2010)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN19**
Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

- Surface description (See Table 3-1)
- Manning's roughness coeff., n
- Flow length, L (total $L < 150$ ft).....ft
- 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
- Land slope, sft/ft
- $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Grass)
2.Short Grass Prairie
0.15
79
3.2
0.051
0.093

N/A
0
0
0
0.000
0.000

+

=

0.093 hr.
5.580 min.

Shallow concentrated flow

Segment ID

- Surface description
- Flow length, Lft
- Watercourse slope, sft/ft
- Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
- $T_t = \frac{L}{3600 V}$hr

BC (Grass)
Unpaved
69
0.029
2.748
0.007

N/A
0
0.000
0.000
0.000

+

=

0.007 hr.
0.419 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

- Surface description / Pipe type
- Cross sectional flow area, Aft²
- Wetted perimeter, P_wft
- Hydraulic radius, $r = \frac{A}{P_w}$ft
- Channel slope, sft/ft
- Manning's roughness coeff., n
- $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
- Flow length, Lft
- $T_t = \frac{L}{3600 V}$hr

0

0

+

=

0.000 hr.
0.000 min.

- Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19).....

6 min.

Time of Concentration Calculations

PROPOSED

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN1a**
Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Grass)
2.Short Grass Prairie
0.15
81
3.2
0.034
0.111

N/A
0
0
0
0.000
0.000

+ = **0.111 hr.**
6.664 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Grass)
Unpaved
769
0.016
2.041
0.105

N/A
0
0.000
0.000
0.000

+ = **0.105 hr.**
6.280 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+ = **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) **13 min.**

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN1b**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Pavement)
1. Smooth
0.011
100
3.2
0.034
0.016

BC (Grass)
8. Grasses
0.24
82
3.2
0.060
0.131

+

= 0.147 hr.
8.821 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

Unpaved
0
0.000
0.000
0.000

N/A
0
0.000
0.000
0.000

+

= 0.000 hr.
0.000 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

9 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN2**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L < 150ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
56
3.2
0.042
0.009

N/A
0
0
0
0.000

+

=

0.009 hr.
0.568 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC Paved
Paved
167
0.033
3.693
0.013

N/A
0
0.000
0.000
0.000

+

=

0.013 hr.
0.754 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

=

0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN3**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Grass)
2.Short Grass Prairie
0.15
46
3.3
0.027
0.076

N/A
0
0
0
0.000
0.000

+

= **0.076 hr.**
4.571 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (paved)
Paved
118
0.031
3.562
0.009

N/A
0
0.000
0.000
0.000

+

= **0.009 hr.**
0.552 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0
0
0

0
0
0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN4**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150 ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)	
1. Smooth	
0.011	
67	
3.3	
0.049	
0.010	

N/A	
0	
0	
0	
0.000	
0.000	

= **0.010 hr.**
0.605 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Grass)	
Unpaved	
154	
0.037	
3.095	
0.014	

N/A	
0	
0.000	
0.000	
0.000	

= **0.014 hr.**
0.829 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0	

0	

0	

0	

0	

0	

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN5**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
77
3.2
0.033
0.013

N/A
0
0
0
0.000
0.000

+

= 0.013 hr.
0.810 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
101
0.052
4.631
0.006

N/A
0
0.000
0.000
0.000

+

= 0.006 hr.
0.363 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
 Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN6**
 Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)	
1. Smooth	
0.011	
100	
3.3	
0.016	
0.022	

N/A	
0	
0	
0	
0.000	
0.000	

+

= **0.022 hr.**
1.311 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))..ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)	
Paved	
153	
0.057	
4.870	
0.009	

N/A	
0	
0.000	
0.000	
0.000	

+

= **0.009 hr.**
0.524 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0	

0	

0	

0	

0	

0	

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN7**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
100
3.3
0.055
0.013

N/A
0
0
0
0.000
0.000

+

= **0.013 hr.**
0.796 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
179
0.053
4.680
0.011

N/A
0
0.000
0.000
0.000

+

= **0.011 hr.**
0.637 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN8**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (nL)^{0.9}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
115
3.2
0.065
0.014

N/A
0
0
0
0.000
0.000

+

= **0.014 hr.**
0.846 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
198
0.047
4.407
0.012

N/A
0
0.000
0.000
0.000

+

= **0.012 hr.**
0.749 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN9**

Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
42
3.2
0.037
0.008

N/A
0
0
0
0.000
0.000

+

= 0.008 hr.
0.476 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4)) ft/s
11. $T_t = \frac{L}{3600 V}$ hr

N/A
N/A
0
0.000
0.000

N/A
0
0.000
0.000
0.000

+

= 0.000 hr.
0.000 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

0 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN10**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{0.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
38
3.2
0.052
0.006

N/A
0
0
0
0.000
0.000

+

= 0.006 hr.
0.381 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
87
0.023
3.076
0.008

N/A
0
0.000
0.000
0.000

+

= 0.008 hr.
0.471 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN11**

Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)	
1.Smooth	
0.011	
38	
3.2	
0.052	
0.006	

N/A	
0	
0	
0	
0.000	
0.000	

+

= **0.006 hr.**
0.381 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)	
Paved	
48	
0.005	
1.437	
0.009	

N/A	
0	
0.000	
0.000	
0.000	

+

= **0.009 hr.**
0.557 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0	
0	
0	

0	
0	
0	

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: 76-193

Designed by:

CZ

Date: 4/11/2014

Location: MANCHESTER

Checked by:

Date:

COUNTY:

HARTFORD

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID:

IN12

Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)

1.Smooth

0.011

78

3.2

0.045

0.012

N/A

0

0

0

0.000

0.000

+

= 0.012 hr.

0.718 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)

Paved

117

0.013

2.300

0.014

N/A

0

0.000

0.000

0.000

+

= 0.014 hr.

0.848 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+

= 0.000 hr.

0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

2 min.

use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: 76-193 Designed by: CZ Date: 4/11/2014

Location: MANCHESTER Checked by: Date:

COUNTY: HARTFORD

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: IN13

Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1.Smooth
0.011
82
3.2
0.024
0.016

N/A
0
0
0
0.000
0.000

+

= 0.016 hr.
0.961 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
157
0.006
1.626
0.027

N/A
0
0.000
0.000
0.000

+

= 0.027 hr.
1.609 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

3 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: 76-193 Designed by: CZ Date: 4/11/2014

Location: MANCHESTER Checked by: Date:

COUNTY: HARTFORD

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: IN14
Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.58}}{P_2^{0.5} s^{0.4}}$hr

AB (Paved)
1. Smooth
0.011
100
3.2
0.030
0.017

N/A
0
0
0
0.000
0.000

+

= 0.017 hr.
1.030 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Paved)
Paved
310
0.026
3.286
0.026

Paved
0
0.000
0.000
0.000

+

= 0.026 hr.
1.572 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

+

= 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

3 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN15**

Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

- Surface description (See Table 3-1)
- Manning's roughness coeff., n
- Flow length, L (total $L < 150$ ft).....ft
- 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
- Land slope, s ft/ft
- $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Grass)
9.Lt. Woods
0.4
103
3.2
0.131
0.173

N/A
0
0
0
0.000
0.000

+

= **0.173 hr.**
10.368 min.

Shallow concentrated flow

Segment ID

- Surface description
- Flow length, Lft
- Watercourse slope, sft/ft
- Average velocity, V (CTDOT Drainage (6.C.4)) ft/s
- $T_t = \frac{L}{3600 V}$ hr

BC (Grass)
Unpaved
147
0.153
6.311
0.006

CD (Grass)
Unpaved
202
0.041
3.247
0.017

+

= **0.024 hr.**
1.425 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

- Surface description / Pipe type
- Cross sectional flow area, A ft²
- Wetted perimeter, P_w ft
- Hydraulic radius, $r = \frac{A}{P_w}$ ft
- Channel slope, s ft/ft
- Manning's roughness coeff., n
- $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
- Flow length, Lft
- $T_t = \frac{L}{3600 V}$ hr

0

0

+

= **0.000 hr.**
0.000 min.

- Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

12 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN16**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total L ≤ 150 ft).....ft
4. 2-yr 24-hr rainfall, P₂, ConnDOT DM Table B-1).....in
5. Land slope, sft/ft
6. $T_t = \frac{.007 (n L)^{0.8}}{P_2^{0.5} s^{0.4}}$ hr

AB (Paved)
1. Smooth
0.011
50
3.2
0.019
0.012

N/A
0
0
0
0.000
0.000

+

= **0.012 hr.**
0.707 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, L.....ft
9. Watercourse slope, s.....ft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)
Paved
82
0.028
3.402
0.007

N/A
0
0.000
0.000
0.000

+

= **0.007 hr.**
0.402 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, L.....ft
19. $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2002)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: Date:

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN17**
Subwatershed/Inlet ID:

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L \leq 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, s ft/ft
6. $T_t = \frac{L}{3600 V}$ hr
 $P_2^{0.5} s^{0.4}$

AB (Paved)	
1.Smooth	
0.011	
43	
3.2	
0.023	
0.010	

N/A	
0	
0	
0	
0.000	
0.000	

+ = **0.010 hr.**
0.583 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4)) .ft/s
11. $T_t = \frac{L}{3600 V}$ hr

BC (Paved)	
Paved	
107	
0.026	
3.278	
0.009	

N/A	
0	
0.000	
0.000	
0.000	

+ = **0.009 hr.**
0.544 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, A ft²
14. Wetted perimeter, P_w ft
15. Hydraulic radius, $r = \frac{A}{P_w}$ ft
16. Channel slope, s ft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$ hr

0	

0	

0	

0	

0	

0	

+ = **0.000 hr.**
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)
1 min.
use 5 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN18**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

- Surface description (See Table 3-1)
- Manning's roughness coeff., n
- Flow length, L (total $L \leq 150$ ft).....ft
- 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
- Land slope, s ft/ft
- $T_t = \frac{.007 (n L)^{0.9}}{P_2^{0.5} s^{0.4}}$ hr

AB (Woods)
9.Lt. Woods
0.4
130
3.2
0.250
0.161

N/A
0
0
0
0.000
0.000

+

= 0.161 hr.
9.645 min.

Shallow concentrated flow

Segment ID

- Surface description
- Flow length, Lft
- Watercourse slope, sft/ft
- Average velocity, V (CTDOT Drainage (6.C.4))ft/s
- $T_t = \frac{L}{3600 V}$ hr

BC (Woods)
Unpaved
282
0.011
1.692
0.046

N/A
0
0.000
0.000
0.000

+

= 0.046 hr.
2.777 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

- Surface description / Pipe type
- Cross sectional flow area, A ft²
- Wetted perimeter, P_w ft
- Hydraulic radius, $r = \frac{A}{P_w}$ ft
- Channel slope, s ft/ft
- Manning's roughness coeff., n
- $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ ft/s
- Flow length, Lft
- $T_t = \frac{L}{3600 V}$ hr

0

0

0

0

0

0

+

= 0.000 hr.
0.000 min.

- Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)

12 min.

TIME OF CONCENTRATION (T_c) OR TRAVEL TIME (T_t)

(Derived from ConnDOT Drainage Manual October 2000)

Project: **76-193** Designed by: **CZ** Date: **4/11/2014**

Location: **MANCHESTER** Checked by: _____ Date: _____

COUNTY: **HARTFORD**

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Watershed/Inlet ID: **IN19**
Subwatershed/Inlet ID: _____

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (See Table 3-1)
2. Manning's roughness coeff., n
3. Flow length, L (total $L < 150$ ft).....ft
4. 2-yr 24-hr rainfall, P_2 , ConnDOT DM Table B-1).....in
5. Land slope, sft/ft.
6. $T_t = \frac{.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$hr

AB (Grass)
2.Short Grass Prairie
0.15
79
3.2
0.051
0.093

N/A
0
0
0
0.000
0.000

+ = 0.093 hr.
5.580 min.

Shallow concentrated flow

Segment ID

7. Surface description
8. Flow length, Lft
9. Watercourse slope, sft/ft
10. Average velocity, V (CTDOT Drainage (6.C.4))ft/s
11. $T_t = \frac{L}{3600 V}$hr

BC (Grass)
Unpaved
69
0.029
2.748
0.007

N/A
0
0.000
0.000
0.000
0.000

+ = 0.007 hr.
0.419 min.

Channel flow (Mannings's rough. coeff. "n" - refer to ConnDOT Drainage Manual Tables 7-1 or Appendix A, page 8.A-1)

Segment ID

12. Surface description / Pipe type
13. Cross sectional flow area, Aft²
14. Wetted perimeter, P_wft
15. Hydraulic radius, $r = \frac{A}{P_w}$ft
16. Channel slope, sft/ft
17. Manning's roughness coeff., n
18. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ft/s
19. Flow length, Lft
19. $T_t = \frac{L}{3600 V}$hr

0

0

0

0

0

0

+ = 0.000 hr.
0.000 min.

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)
6 min.

DATE PREPARED

3/7/13

DATE CHECKED

PREPARED BY

PWY

CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

SHEET NO.

1

SUBJECT:

PROPOSED TRENCH:

DIMENSIONS: 5'(W) X 100'(L) X 5'(D) SEE DIAGRAM ON SHEET 3

INFILTRATION A = 500 SF.

$$V = 2500 \text{ ft}^3$$

$$V_{\text{storage}} = V_e \quad \begin{array}{l} \text{void ratio} \\ \text{3" stone} \end{array}$$

$$= 2500 \text{ ft}^3 (0.4)$$

$$= 1000 \text{ ft}^3$$

ASSUME: $T_c = 13$ mins post-installation

$$V_{\text{stor}} = \frac{1}{2} Q_{10\text{yr}} (19.5\text{m}) (60 \frac{\text{s}}{\text{min}})$$

$$Q_{10\text{yr}} = \frac{V_s(2)}{(19.5\text{m})(60 \frac{\text{s}}{\text{min}})}$$

$$= (1000 \text{ ft}^3)(2) / (19.5\text{m})(60 \frac{\text{s}}{\text{min}})$$

BACK CALCULATION

$$Q_{10\text{yr}} = 1.7 \text{ cfs}$$

THIS FLOW IS INFILTRATED INTO THE TRENCH

MEETING THE TRENCH FLOW CAPACITY REQUIREMENTS

MEETING THE FLOW CAPACITY REQUIREMENTS

$$Q_{\text{NET}} = 4.0 \text{ cfs} - 1.7 \text{ cfs}$$

$$= 2.3 \text{ cfs} \leftarrow \text{NEW FLOW}$$

$$2.3 \text{ cfs} \ll 2.6 \text{ cfs}$$

$$Q_{\text{NET}} \ll \text{EXISTING } Q_{10}$$

IMPROVING THE OVERALL WATER QUALITY BY
REDUCING ROADWAY RUNOFF WHILE STILL
MEETING H&D REQUIREMENTS.

DATE PREPARED

3/17/13

PREPARED BY

PWY

DATE CHECKED

CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

SHEET NO.

2

SUBJECT:

PLAN NOT TO SCALE

NORTH

PROPOSED
5'x100'x5'
INFILTRATION
TRENCH

EXIT 63 OFF-RAMP

Bridge
5235

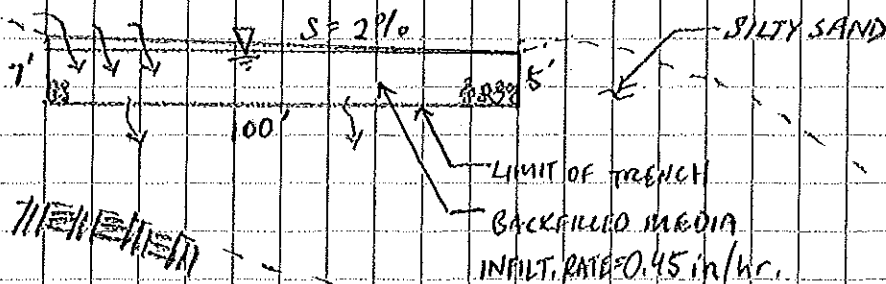
Hockanum
River

Route 80

Route
83

PROFILE:

SECTION A-A



DATE PREPARED
3/17/13
DATE CHECKED

PREPARED BY
Puy
CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO. WORK ORDER NO.

1310

76-193
SHEET NO. 3

SUBJECT:

SECTION

B-B

EDR FOOTW

EDW

EDR

PROP. INFILTRATION BASIN

I-84 OFF RAMP

STA 214+00

4'-1"
5'

DATE PREPARED
3/17/13
DATE CHECKED

PREPARED BY
PWY
CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

WORK ORDER NO.

SHEET NO.

SUBJECT:

1310

76-193

4

DETERMINING STORAGE VOLUME:

$$Q_{10\text{ YR EXIST}} = 2.6 \text{ cfs (FROM DRAINAGE COMPS.)}$$

$$Q_{10\text{ YR PROP}} = 4.0 \text{ cfs (FROM DRAINAGE COMPS.)}$$

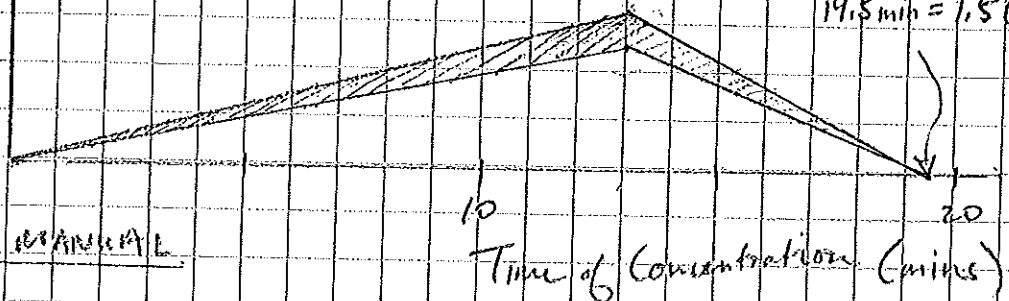
$$T_C = 13 \text{ mins}$$

$Q_{10\text{ YR}}$
(cfs)

ΔA = Volume Increase

Factor
given by
H&D

$$19.5 \text{ min} = 1.5 \times 13 \text{ min}$$



METHOD 1: H&D MANUAL

$$\begin{aligned} \text{Volume Increase} &= \left[\frac{1}{2} (4.0 \text{ cfs}) (19.5 \text{ min}) \left(\frac{1}{60 \frac{\text{min}}{\text{hr}}} \right) \right] - \left[\frac{1}{2} (2.6 \text{ cfs}) (13 \text{ min}) \left(\frac{1}{60 \frac{\text{min}}{\text{hr}}} \right) \right] \\ &= 2340 \text{ ft}^3 - 1521 \text{ ft}^3 \\ &= 819 \text{ ft}^3 \end{aligned}$$

METHOD 2: STORM QUALITY MANUAL

PROPOSED
SITE AREA

$$\text{WATER QUALITY VOLUME (WQV)} = (1") (R) (A) / 12$$

$$R = 0.05 + 0.009 I$$

$$= 0.05 + 0.009 \left(\frac{0.6 \text{ Acres}}{1.8 \text{ Acres}} \right) \times 100$$

$$= 0.35$$

Impervious
Area

Total Area

$$\text{WQV} = 1" (0.35) (1.8 \text{ Acres}) / 12$$

$$= 0.053 \text{ Acre} \cdot \text{ft}$$

$$= 2287 \text{ ft}^3$$

DATE PREPARED

9/17/13

DATE CHECKED

PREPARED BY

CZ

CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

SHEET NO. 5

SUBJECT:

WQF (Appendix B CT Stormwater Quality Manual):

$$WQV = 2287 ft^3 = .053 \text{ acre-foot} \rightarrow \text{from previous calculations}$$

$$CN = \frac{1000}{(10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{.5})}$$

CN = runoff curve number

P = design precipitation (inches) = 1 inch

Q = runoff depth (inches)

$$\rightarrow \frac{WQV (\text{ac-ft}) \times 12 (\text{in/ft})}{\text{drainage area (acres)}} = \frac{.053 \times 12}{1.8} \Rightarrow Q = .353 \text{ in}$$

$$CN = \frac{1000}{(10 + 5(1) + 10(.353) - 10(.353^2 + 1.25 \cdot .353 \cdot 1)^{.5})} = \frac{1000}{18.53 - 10(.7522)} \Rightarrow CN = 90.85 \rightarrow \text{use } 91$$

$$T_c = 13 \text{ min}$$

→ from previous calcs per H&D

$$I_a = .198 \text{ in}$$

→ per Table 4-1: Appendix B

$$q_v = 520 \text{ csm/in}$$

→ Exhibit 4-III

$$WQF = q_v \cdot A \cdot Q$$

$$WQF = 520 \text{ csm/in} \times .0028 \text{ mi}^2 \times .353 \text{ in} \Rightarrow WQF = .514 \text{ cfs}$$

DATE PREPARED

10/1/13

PREPARED BY

CZ

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

DATE CHECKED

CHECKED BY

SHEET NO.

1

SUBJECT:

WQN Calculations Sedimentation Basin (Drainage area A):

Weighted 'I':

$$A3 - I = .74 \times 39,768 \text{ sf} = 29,428 \text{ sf}$$

$$A4 - I = .39 \times 16,130 = 6,291 \text{ sf}$$

$$A5 - I = .88 \times 24,183 = 21,281 \text{ sf}$$

$$A10 - I = .59 \times 7,795 = 4,599 \text{ sf}$$

$$A11 - I = .71 \times 6,858 = 4,869 \text{ sf}$$

$$A12 - I = .65 \times 16,658 = 10,828 \text{ sf}$$

$$A13 - I = .67 \times 20,824 = 13,952 \text{ sf}$$

$$\text{Total impervious area } A = 91,248 \text{ sf}$$

$$\text{Total area } A = 132,216 \text{ sf}$$

$$\text{Area } A \text{ 'I' value} = .69$$

WQV:

$$WQV = \frac{1" \cdot R \cdot A}{12}$$

$$R = .05 + .009(I) \Rightarrow .05 + .009(.69) \rightarrow R = .671$$

$$A = 132,216 \text{ sf} / 43,560 \frac{\text{sf}}{\text{ac}} = 3.04 \text{ acres}$$

$$WQV = \frac{1" \cdot .671 \cdot 3.04}{12} \rightarrow WQV = .167 \text{ ac} \cdot \text{ft} \times 43,560 \frac{\text{sf}}{\text{ac}} = 7,275 \text{ ft}^3$$

PROJECT DESCRIPTION	DEPARTMENT OF TRANSPORTATION				DATE	PROJECT NO.	By:
	OFFICE OF ENGINEERING						
TOWNE					UNIT:	SHEET NO.	checked:
MANCHESTER	SEDIMENTATION BASIN VOLUME COMPS						
	H.I.		ELEV. 162.14				
STATION	END AREA	DOUBLE END AREA	CUBIC FEET	CUBIC YARDS	END AREA	DOUBLE END AREA	CUBIC FEET
	AREA	END AREA	FEET	YARDS	AREA	END AREA	FEET
2085	0	---	---	---	0	---	---
2090	5 60.19	30	150	6	0		
2100	10 61.18	61	607	22	0		
2110	10 61.18	61	612	23	0		
2120	10 61.18	61	612	23	0		
2130	10 1.74	31	315	12	0		
2136	6 1.74	2	10	0	0		
	0	1			0		
	0				0		
	0				0		
	0				0		
	0				0		
	0				0		
	0				0		
	0				0		
TOTALS			2306	86		0	0

**ATTACHMENT I
FLOOD CONTINGENCY PLAN
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWNS: Manchester, Connecticut

There is no construction activity proposed that would pose a hazard to human life, health, or property during significant precipitation events. The Contractor will be prohibited from storing any equipment and materials (other than water handling equipment) within wetland areas.

Prior to commencement of any construction, the Contractor will submit to the Engineer for approval, a written Flood Contingency Plan. The plan will include the following:

- A description of the means by which the Contractor will remove from within the river, all material, equipment and personnel prior to a predicted major storm. A major storm shall be defined as a storm predicted by the NOAA weather service with warnings of flooding, severe thunderstorms, or similarly severe weather conditions or effects.
- Provisions for notifying workers engaged in work on or near the bridge or bridge abutments of an impending storm.
- Provisions for securing work in progress prior to a major storm.

The Contractor shall submit the Flood Contingency Plan for approval at the preconstruction meeting.

No long term storage of construction equipment and/or material will occur within the 500-year flood boundary unless such equipment or material is not subject to major flood damage, or is anchored, restrained, or enclosed to prevent it from floating away or is removed prior to flooding.

Work within or adjacent to watercourse will be conducted during periods of low flow, whenever possible. The Engineer will remain aware of flow conditions during the conduct of such work and will direct the Contractor to stop this work if flow conditions threaten to cause excessive erosion, siltation, or turbidity.

During construction, the Contractor will be bound by the conditions set forth in the Department's "Standard Specifications for Roads, Bridges, and Incidental Construction", Form 816, Section 1.10, Environmental Compliance, Best Management Practices, which addresses the need for the Contractor to maintain a stable work area.

The Department is responsible for maintaining the integrity of the facility after completion of the project. All drainage facilities have been designed in accordance with the Department's *Drainage Manual* to prevent damage to people and property. Therefore, the need for a special flood operation plan upon completion of the project is not foreseen since all drainage facilities will be hydraulically adequate for the design flow. Any deficiencies will be noted and corrected in a timely manner.

**ATTACHMENT I
FLOOD CONTINGENCY PLAN
PROJECT 76-193**

Contact Information:

Construction:

Ravi Chandran
District 1 Engineer
(860) 258-4601

Post Construction:

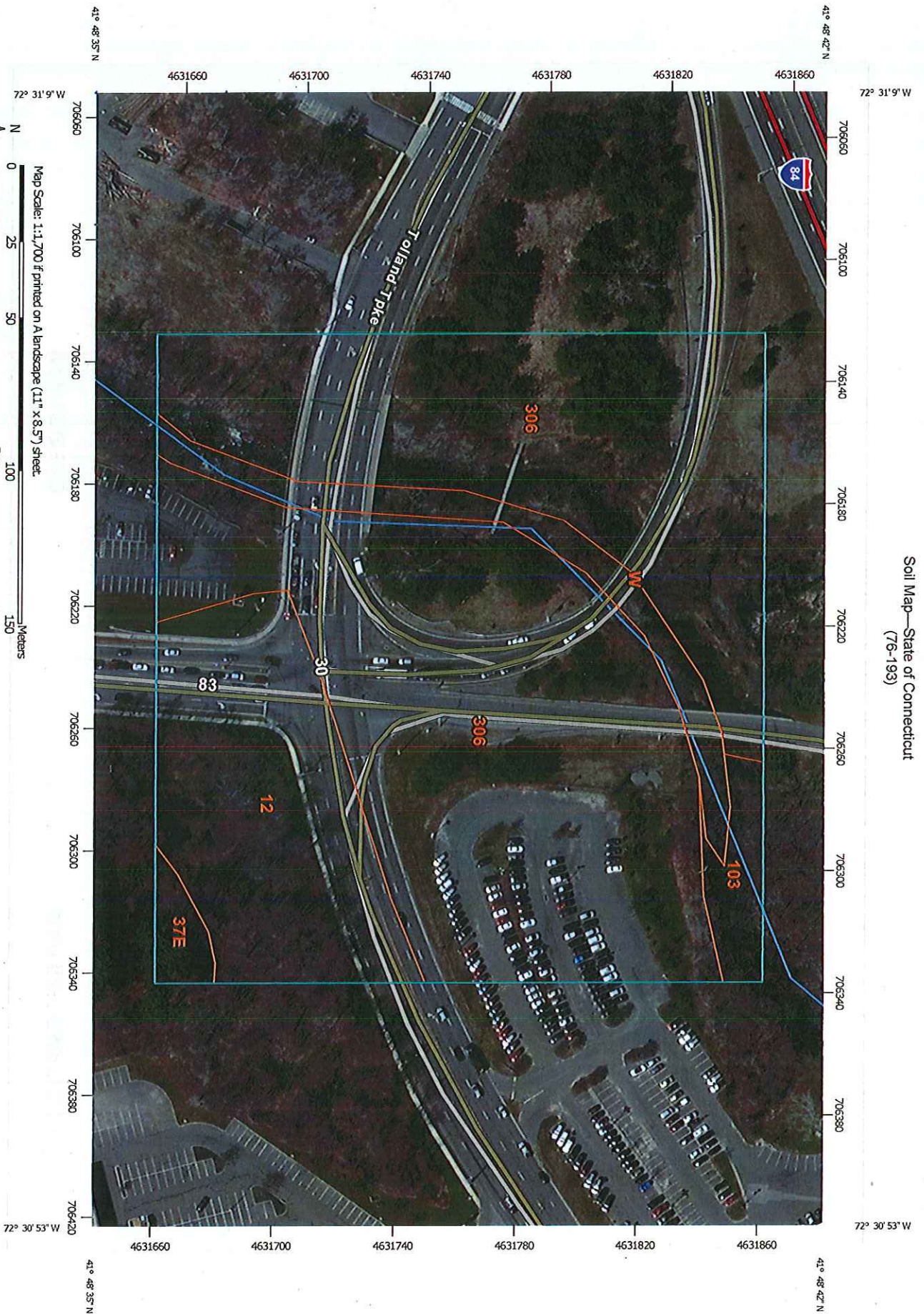
Alan A. White, District 1 Maintenance
Director
(860) 258-4501

ATTACHMENT J: SOILS REPORT

CTDOT 76-193

***005234 o/Hockanum River, Interstate 84 EB Exit 63 Off-Ramp and Intersection
of Routes 30 & 83 Manchester, Connecticut***

Soil Map—State of Connecticut (76-193)



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

10/16/2013
Page 1 of 3

MAP LEGEND

	Area of Interest (AOI)		Spoil Area
	Area of Interest (AOI)		Stony Spot
	Soils		Very Stony Spot
	Soil Map Unit Polygons		Wet Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
	Special Point Features		Water Features
	Blowout		Streams and Canals
	Borrow Pit		Transportation
	Clay Spot		+++
	Closed Depression		Rails
	Gravel Pit		Interstate Highways
	Gravelly Spot		US Routes
	Landfill		Major Roads
	Lava Flow		Local Roads
	Marsh or swamp		Background
	Mine or Quarry		Aerial Photography
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 10, Mar 31, 2011

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 28, 2011—May 12, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	1.9	18.1%
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	0.1	1.4%
103	Rippowam fine sandy loam	0.3	2.6%
306	Udorthents-Urban land complex	7.6	72.2%
W	Water	0.6	5.7%
Totals for Area of Interest		10.6	100.0%

State of Connecticut

12—Raypol silt loam

Map Unit Setting

Elevation: 0 to 1,200 feet

Mean annual precipitation: 43 to 54 inches

Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 140 to 185 days

Map Unit Composition

Raypol and similar soils: 80 percent

Minor components: 20 percent

Description of Raypol

Setting

Landform: Drainageways, depressions

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Coarse-loamy eolian deposits over sandy and
gravelly glaciofluvial deposits derived from granite and/or schist
and/or gneiss

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 7.0 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability (nonirrigated): 4w

Hydrologic Soil Group: D

Typical profile

0 to 8 inches: Silt loam

8 to 12 inches: Very fine sandy loam

12 to 20 inches: Silt loam

20 to 26 inches: Silt loam

26 to 29 inches: Very fine sandy loam

29 to 52 inches: Stratified very gravelly coarse sand to loamy fine
sand

52 to 65 inches: Stratified very gravelly coarse sand to loamy fine
sand

Minor Components**Haven**

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear

Enfield

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear

Ninigret

Percent of map unit: 3 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Concave

Tisbury

Percent of map unit: 2 percent
Landform: Terraces, outwash plains
Down-slope shape: Concave
Across-slope shape: Linear

Walpole

Percent of map unit: 2 percent
Landform: Drainageways on terraces, depressions on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Scarboro

Percent of map unit: 2 percent
Landform: Terraces, drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave

Unnamed, loamy substratum

Percent of map unit: 1 percent

Data Source Information

Soil Survey Area: State of Connecticut
Survey Area Data: Version 10, Mar 31, 2011

State of Connecticut

37E—Manchester gravelly sandy loam, 15 to 45 percent slopes

Map Unit Setting

Elevation: 0 to 1,200 feet

Mean annual precipitation: 43 to 54 inches

Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 140 to 185 days

Map Unit Composition

Manchester and similar soils: 80 percent

Minor components: 20 percent

Description of Manchester

Setting

Landform: Terraces, kames, outwash plains, eskers

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Properties and qualities

Slope: 15 to 45 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 7e

Hydrologic Soil Group: A

Typical profile

0 to 9 inches: Gravelly sandy loam

9 to 18 inches: Gravelly loamy sand

18 to 65 inches: Stratified extremely gravelly coarse sand to very gravelly loamy sand

Minor Components

Penwood

Percent of map unit: 5 percent

Landform: Terraces, outwash plains

Down-slope shape: Convex

Across-slope shape: Linear

Hartford

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear

Branford

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear

Walpole

Percent of map unit: 3 percent
Landform: Drainageways on terraces, depressions on terraces
Down-slope shape: Concave
Across-slope shape: Concave

Scitico

Percent of map unit: 2 percent
Landform: Terraces, drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave

Data Source Information

Soil Survey Area: State of Connecticut
Survey Area Data: Version 10, Mar 31, 2011

State of Connecticut

103—Rippowam fine sandy loam

Map Unit Setting

Elevation: 0 to 1,200 feet

Mean annual precipitation: 43 to 54 inches

Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 140 to 185 days

Map Unit Composition

Rippowam and similar soils: 80 percent

Minor components: 20 percent

Description of Rippowam

Setting

Landform: Flood plains

Down-slope shape: Linear

Across-slope shape: Concave

Parent material: Coarse-loamy alluvium

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to high (0.57 to 5.95 in/hr)

Depth to water table: About 0 to 18 inches

Frequency of flooding: FrequentNone

Frequency of ponding: None

Available water capacity: Low (about 5.9 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability (nonirrigated): 4w

Hydrologic Soil Group: D

Typical profile

0 to 5 inches: Fine sandy loam

5 to 12 inches: Fine sandy loam

12 to 19 inches: Fine sandy loam

19 to 24 inches: Sandy loam

24 to 27 inches: Sandy loam

27 to 31 inches: Loamy sand

31 to 65 inches: Stratified very gravelly coarse sand to loamy fine sand

Minor Components

Suncook

Percent of map unit: 5 percent

Landform: Flood plains

Down-slope shape: Linear
Across-slope shape: Convex

Occum

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

Pootatuck

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave

Lim

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Saco

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Limerick

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave

Data Source Information

Soil Survey Area: State of Connecticut
Survey Area Data: Version 10, Mar 31, 2011

State of Connecticut

306—Udorthents-Urban land complex

Map Unit Setting

Elevation: 0 to 2,000 feet

Mean annual precipitation: 43 to 56 inches

Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 120 to 185 days

Map Unit Composition

Udorthents and similar soils: 50 percent

Urban land: 35 percent

Minor components: 15 percent

Description of Udorthents

Setting

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Drift

Properties and qualities

Slope: 0 to 25 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)

Depth to water table: About 54 to 72 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 3e

Hydrologic Soil Group: B

Typical profile

0 to 5 inches: Loam

5 to 21 inches: Gravelly loam

21 to 80 inches: Very gravelly sandy loam

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 8

Typical profile

0 to 6 inches: Material

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent

Udorthents, wet substratum

Percent of map unit: 5 percent

Down-slope shape: Convex

Across-slope shape: Linear

Rock outcrop

Percent of map unit: 2 percent

Data Source Information

Soil Survey Area: State of Connecticut

Survey Area Data: Version 10, Mar 31, 2011

**ATTACHMENT K: ENVIRONMENTAL REPORT
CTDOT 76-193**

**005234 o/Hockanum River, Interstate 84 EB Exit 63 Off-Ramp and Intersection
of Routes 30 & 83 Manchester, Connecticut**

Introduction

This project encompasses the I-84 eastbound Exit 63 off-ramp including improvements to the Route 30 and Route 83 approaches in the Town of Manchester. There are three regulated sites affected by construction activities with a total regulated area impact of 0.156 acres (6,799 sq. ft.). The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp, as well as intersection improvements along Routes 30 and 85. The new off-ramp alignment will require the replacement of the existing bridge (Site 1), minor drainage modifications including cleaning out an existing basin (Site 2), and widening Route 83 on the east side (Site 3). Erosion and Sedimentation controls will be installed prior to the start of work. Allowable time periods for unconfined and confined in-stream work provided by DEEP will determine when the Contractor will be allowed to work within the Hockanum River. Best Management Practices are required to set up and remove cofferdams and dewatering systems. All water handling and dewatering will be in accordance with the *Best Management Practices* as outlined in The Departments' *Standard Specifications for Roads, Bridges and Incidental Construction Form 816*.

Existing Conditions: Site 1

This site consists of the replacement of Bridge No. 05234 which carries Interstate 84 over the Hockanum River. This area is depicted on sheet PER-02 of the Permit Plan Sheets in Attachment G. There is a mapped floodway associated with the Hockanum River in the project area. The site is not located within any public watershed or aquifer protection area. The project area falls outside habitat for any known Federal or State listed species.

There are State and Federal wetlands found along the Hockanum River at Site1. However there is no vegetative community (wetland and upland) associated with this stretch. The project area consists of large riprap down to Ordinary High Water. The Hockanum River in this stretch is characterized by a cobble/ rocky substrate. The river is approximately 20-25 feet wide with a Water Quality Classification of GA-Impaired. The flows are fast moving with riffle areas. This stretch has areas of undercut banks upstream and downstream. Functions and Value Assessments follow US Army Corps of Engineers Highway Methodology Workbook. The primary functions of the system are floodflow alteration, sediment/toxicant/pathogen retention, and sediment/shoreline stabilization. The primary functions are derived from the proximity of the wetlands to inputs of sediments/toxicants (Interstate 84). The wetland/stream complex also serves limited functions in groundwater recharge/discharge and production export. The Hockanum River provides fish and wildlife habitat. These additional functions are limited by the landscape position, adjacent to the state route, and these functions are better served beyond the project limits, as there are large undeveloped areas both up and downstream of the site. Soil types throughout this area are made up of Udorthents- Urban land complex.

Proposed Conditions: Site 1

Only temporary impacts are required at Site 1 totaling 0.101 acres. The impacts are required in order to install the proposed water handling system that will be needed for constructing the new bridge abutments adjacent to the Hockanum River. All grading will be reestablished to match the existing conditions once the construction activities are finalized. All disturbed areas will be turf established and re-vegetated with a native planting plan provided by the Office of Environmental Planning.

Existing Conditions: Site 2

Site 2 consists of a modified riprap scour hole that has filled in with sediment over time. Currently, the water discharges from the outlet and has created a small, well defined channel through the deposited sediment and continues down the remaining riprap channel to the Hockanum River. Trees and brush have grown in the sediment deposited in the existing scour hole making it ineffective. This area is depicted on sheet PER-02 of the Permit Plan Sheets in Attachment G. This area is located within a FEMA floodway. The site is not located within either a public water supply watershed or an aquifer protection zone. Coordination with CTDEEP Natural Diversity Database has determined this site is not located in any area identified as habitat for State listed species.

Areas of state and federal wetland are found from the outlet pipe down to the Hockanum River. The vegetative community (wetland and upland) in this area consists of red maple (*Acer rubrum*) and Eastern cottonwood (*Populus deltoides*) within the canopy. The shrub layer consists of autumn olive (*Elaeagnus umbellata*)*, Japanese knotweed (*Fallopia japonica*)*, and silky dogwood (*Cornus amomum*). The herbaceous layer is dominated by jewelweed (*Impatiens capensis*), and spotted Joe-pye weed (*Eutrochium maculatum*).

The flows coming out of the drainage pipe and through this area are slow moving and have a Water Quality Classification of GA-Impaired. Functions and Value Assessments follow US Army Corps of Engineers Highway Methodology Workbook. The primary functions of the system are floodflow alteration, and sediment/toxicant/pathogen retention. The primary functions are derived from the proximity of the wetlands to inputs of sediments/toxicants (State Route 85/30 and I-84). The wetland/stream complex also serves limited functions in groundwater recharge/discharge and production export. These additional functions are limited by the landscape position, adjacent to the state routes and interstate, and these functions are better served beyond the project limits, as the area flows into the Hockanum River. Soil type throughout this area is Udorthents-Urban land complex.

Proposed Conditions: Site 2

Minor drainage modifications will be required to align the drainage structures at the new edge of pavement throughout the project. The existing modified riprap channel at the 18 inch R.C.C.E. located at approximately Sta. 219+75, 112' Right has filled in with sediment over time, causing it to be delineated as an inland wetland. Trees and brush have grown throughout the riprap outlet channel and water discharging from the outlet has created a well-defined channel through the

sediment and down to the Hockanum River. Due to the reduction in paved surfaces throughout this drainage system, the 10 yr. flow discharging from the outlet has been reduced from 14.8 cfs down to 14.2 cfs. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel. The sediment trap will also reduce the discharge velocity of the stormwater.

The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

Existing Conditions: Site 3

Site 3 is associated with the widening of Route 83 that will require the placement of fill within the wetland. This area is depicted on sheet PER-03 of the Permit Plan Sheets in Attachment G. This wetland is a low swampy area covered with mature trees and brush. The water from this area flows into the state stormwater system on Route 83, eventually discharging from the system into the Hockanum River. Separating the wetland from the state's drainage system is an embankment with a concrete weir. A 15 inch HDPE pipe carries water through the embankment and weir conveying low flows to the state's 24 inch inlet pipe. The existing weir structure has been designed for an adjacent development, Stop & Shop, to use the low-lying wetland to detain flow from their site. Larger flows fill the wetland area until eventually they flow over the weir and into the state system. There are no mapped FEMA floodplain or floodway areas associated with this project site. This impact area is not within any mapped watershed or aquifer protection area. Coordination with CTDEEP Natural Diversity Database has determined that this project site is not located in an area identified as habitat for State listed species.

Areas of state and federal wetland are found within this lowland flood retention area. The vegetative community (wetland and upland) within this site consists of red maple (*Acer rubrum*), white oak (*Quercus alba*), sweet birch (*Betula lenta*), gray birch (*Betula populifolia*), and yellow birch (*Betula allegheniensis*) within the canopy. The shrub layer is dominated by red maple, mountain laurel (*Kalmia latifolia*), highbush blueberry (*Vaccinium corymbosum*), buttonbush (*Cephalanthus occidentalis*) and witch hazel (*Hamamelis virginiana*). The herbaceous layer is dominated by witch hazel, white oak, white pine (*Pinus strobus*), Japanese stiltgrass (*Microstegium vimineum*)*, tussock sedge (*Carex stricta*), arrowleaf tearthumb (*Persicaria sagittata*), meadowsweet (*Spiraea alba*), and mountain laurel.

This wetland area is characterized with flows that are slow moving with riffle areas. This lowland wetland system has a Water quality Classification of GA-Impaired. Functions and Value Assessments follow US Army Corps of Engineers Highway Methodology Workbook. The primary functions of the system are floodflow alteration and sediment/toxicant/pathogen retention. The primary functions are derived from the proximity of the wetlands to inputs of sediments/toxicants (State Route 85). The wetland/stream complex also serves limited functions in groundwater recharge/discharge, production export, and wildlife habitat. These additional functions are limited by the landscape position, adjacent to the state route. Soil types throughout this area are made up of Raypol silt loam and Manchester gravelly sandy loam.

Proposed Conditions: Site 3

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side to avoid any impacts to utility poles along the west side and provide proper alignment with the on-ramp. Widening on the east side will permanently impact wetlands (Site 3) between approximately Sta. 404+25 and Sta. 406+50 Right and will require a slope easement for support of the highway from the adjacent property. A temporary work area is also required in order to install the drainage appurtenances at Sta. 405+25 Right. Although the plans do not indicate any proposed activities within the Temporary Work Area, it will be provided to allow room for waterhandling and access to the inlet of the 15 inch pipe if required.

Approximately 115 cubic yards of fill will be placed in the wetland along the eastern side of Route 83 from approximately Sta. 404+25 and Sta. 406+50 east to provide for the widening and support of the roadway. The total amount of permanent and temporary wetland impact is 0.050 acres. This includes 0.038 acres of permanent wetland impact for the placement of the fill described above and 0.012 acres of temporary wetland impact for the temporary work area.

ATTACHMENT L: MITIGATION REPORT
CTDOT 76-193

***005234 o/Hockanum River, Interstate 84 EB Exit 63 Off-Ramp and Intersection
of Routes 30 & 83 Manchester, Connecticut***

Several improvements are proposed in this project to enhance both habitat and water quality.

The Hockanum River holds high quality fish habitat and Best Management Practices will be used for installation and removal of the cofferdams and/or dewatering systems. All unconfined work will be limited to the low flow period (June 1st to September 30th). All mitigation measures incorporated into the construction of this project aid in the restoration and enhancement of the natural habitat. The proposed construction activities will not have an adverse impact to the existing functions and values. There will also be the placement of a rootwad within the Hockanum River just downstream of structure 05234. This enhancement will provide shade and an area of backwater to improve fish habitat along this stretch of river.

Stormwater Quality improvements are being proposed to the existing drainage outlet located at approximately Sta. 219+75, 112' Right. The riprap channel will be cleaned during construction in order to restore this drainage system back to its original working condition and prevent any material from entering the regulated areas.

To further enhance habitat value, a native planting plan is being provided with this application. The plantings are proposed to reestablish vegetation at all impacted areas in and adjacent to the wetlands. The impact area along Route 83 will be planted with native wetland plant species that match in with the existing vegetation.

During construction, the Contractor will be bound by the conditions set forth in the Department's "Standard Specifications for Roads, Bridges, and Incidental Construction", Form 816, Section 1.10, Environmental Compliance, Best Management Practices, which addresses the need for the Contractor to maintain a stable work area. The Contractor will also utilize proper water handling, soil erosion, and sedimentation control system as described in the 2002 E&S Guidelines.

**ATTACHMENT M
ALTERNATIVES ASSESSMENT
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

Alternate 1: Taking No Action

The Exit 63 EB off-ramp currently has an ADT of 15,700 vehicles per day (vpd) and a projected increase to 18,600 vpd by year 2030. Future traffic volumes will most likely increase the negative effects of the existing operational and safety deficiencies at the location. With no action taken, there will likely be larger traffic queues and continued accident experience at the intersection and on the off-ramp with increased chance of high speed accidents on the I-84 mainline. Furthermore, if no action is taken to repair the structures, operation of the highway, public safety, and the environment could all be jeopardized.

Alternate 2: Widening Existing Off-Ramp

This alternative is similar to the proposed design except for the proposed work on the off-ramp. It is proposed to widen the north side of the existing off-ramp and bridge by 37' to accommodate four lanes of traffic (see attached plan). The alignment of the ramp has been modified to provide a compound curve, where the second curve is significantly sharper than the first. When compared to the existing condition, this alternative increases the SSD on the ramp (from 20 mph to 25 mph). Similar to proposed design, this adjustment to the off-ramp alignment will require shifting the on-ramp alignment to the east resulting in minor widening of the on-ramp.

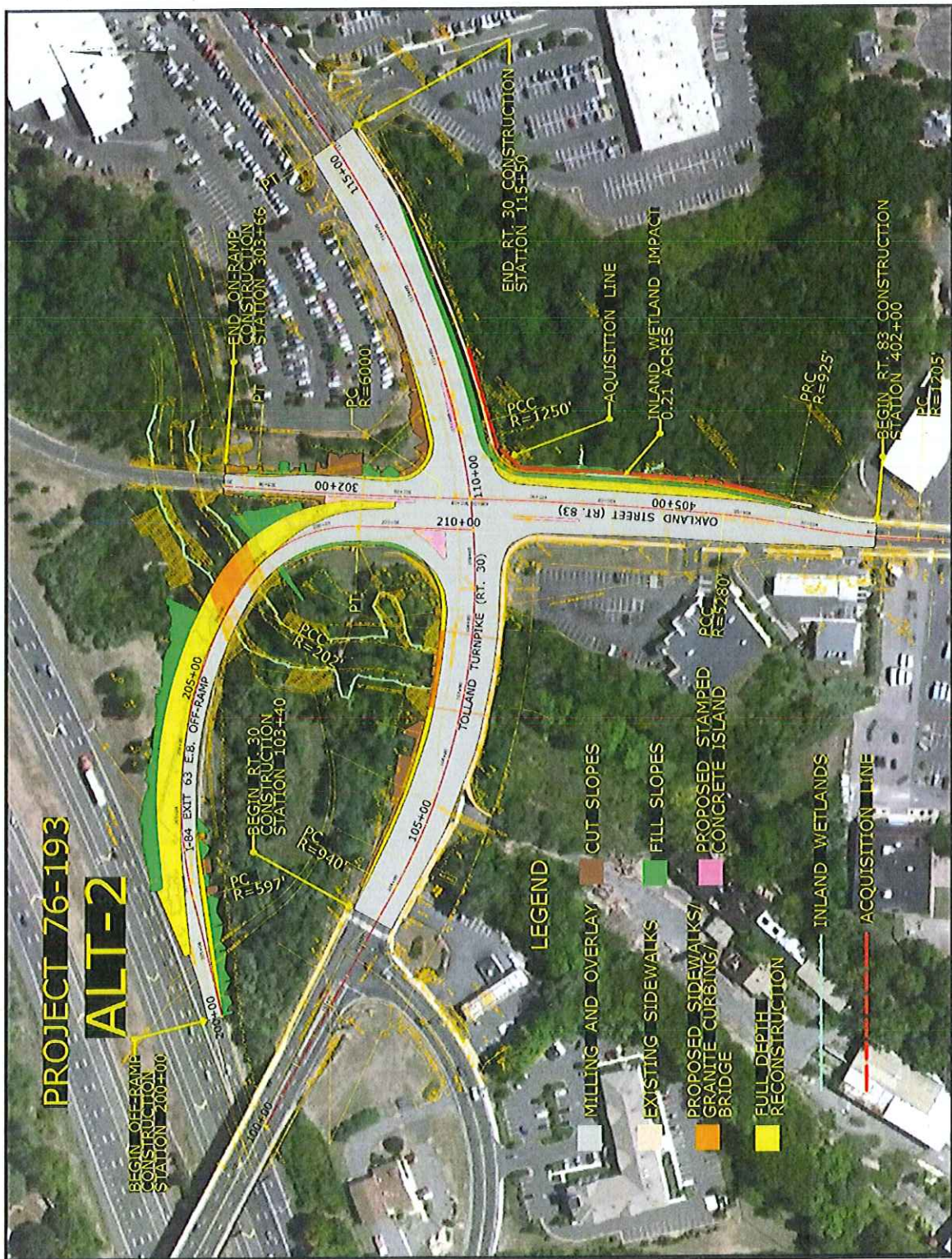
Traffic will be maintained on the existing ramp during construction to widen the existing bridge. Wetland impacts will be similar to the proposed alternative because the extension of the existing bridge abutments is anticipated to be at the same distance from the wetland limits as the new bridge structure.

The proposed work on Routes 30 and 83 is the same as in the proposed design and will require the same impacts to the wetlands in these areas.

Proposed Design:

The proposed reconstruction and new layout of the off-ramp is the most effective solution to addressing the numerous operational and safety issues mentioned previously. The combination of major and minor improvements to the intersection will create a safe and efficient roadway facility for the traveling public. Minor improvements, such as restriping the off-ramp, in the past have not addressed the problems at this location. It would be most practical for time and finances to be utilized making these improvements collectively.

ATTACHMENT M
ALTERNATIVES ASSESSMENT
PROJECT 76-193



**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**

APPLICANT: State of Connecticut, Department of Transportation
PROJECT NUMBER: 76-193
TOWN: Manchester, Connecticut

Attachments:

- Site Photos
- DEEP Inland Fisheries Transmittal Form
- NDDDB Correspondence
- LEAN & PMM Notes

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**

Wetland Site 1:



South Side of Bridge Facing East



South Side of Bridge Facing West

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**



South Side of Bridge Facing North-West

Wetland Site 2:

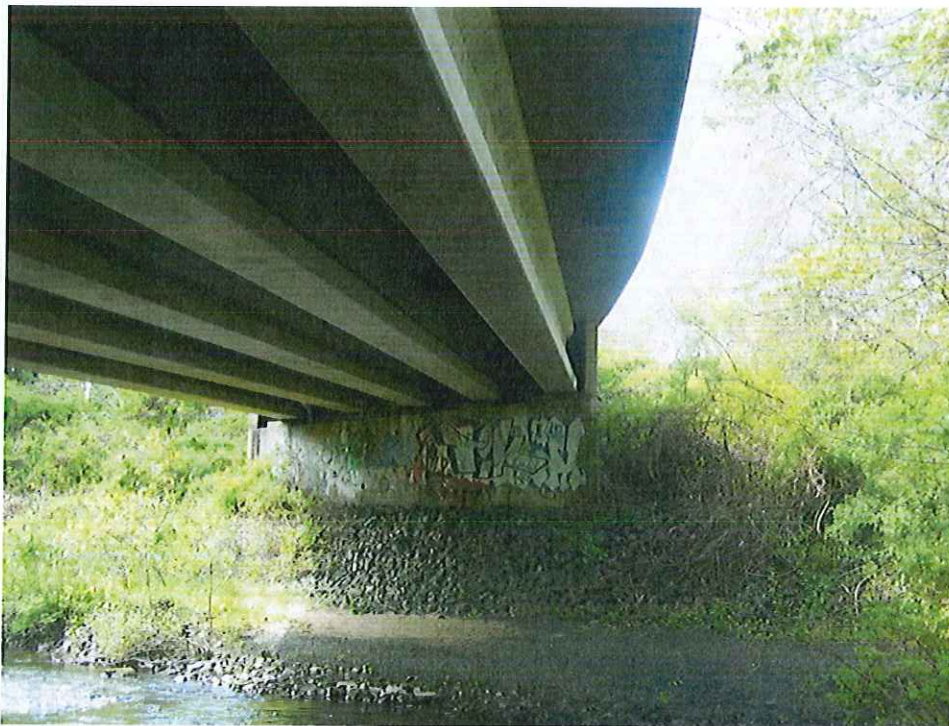


South-East Side of Fence Facing North

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**



North Side of Fence Facing South



North Side of Bridge Facing East

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**



West Side of Fence Facing East

Wetland Site 3:



Weir Structure

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**



Route 83 Facing South



Route 83 Facing South

**ATTACHMENT Q
OTHER INFORMATION
PROJECT 76-193**



Route 83 Facing North

CTDEP INLAND FISHERIES DIVISION COORDINATION TRANSMITTAL MEMORANDUM

DOT Project #: 076-0193

Town: Manchester

Bridge #: 05234

Waterway: Hockanum River

Drainage Basin Name & Number: Manchester #4500

Project Description / Scope of work: I-84 EB Exit 63 Off-Ramp Bridge Replacement

Design contact: Matthew R. Vail - (860) 594-3342

Town Initiated Project? No

Initial Coordination

The following information is provided as required:

Plan /submittal date : _____

- ☐ Legible location map with project site clearly marked
- ☐ Description of scope of work and if developed, pertinent 1/2 scale plans as deemed relevant.
- ☐ Area photographs

To be completed by CTDEP Inland Fisheries Division and returned to DOT Environmental Planning Division

- ☐ Affect of proposal on our program interests is negligible. No further review is warranted.
- ☐ Additional information is required, a list of requested information is attached.
- ☐ Comments and recommendations are attached.

_____ Initials

_____ Date

Structure Type Agreement

The following information is provided as required:

Plan date: _____

- ☐ Copies of previous correspondence from Fisheries Division
- ☐ If previous recommendations cannot be incorporated, provide narrative explaining why.
- ☐ 1/2 scale plans of pertinent plan sheets including plan view, elevation view, profile and details as deemed relevant.

To be completed by CTDEP Inland Fisheries Division and returned to DOT Environmental Planning Division

- ☒ DEP Fisheries agrees to the structure type presented in the plans.
- ☒ Unconfined in-stream work must be limited to June 1 to September 30

BDM: Initials

3/31/14: Date

- ☐ Other comments and recommendations are attached.

Final Fisheries Sign-Off

_____ Check here if project is not FM MOU eligible and will be finalized through DEP IWRD.

The following information is provided as required:

Plan date: _____

- ☐ Copies of all previous correspondence from Fisheries Division
- ☐ If previous recommendations cannot be incorporated, provide narrative explaining why.
- ☐ 1/2 scale plans of pertinent plan sheets including plan view, elevation view, profile and details as deemed relevant.

To be completed by CTDEP Inland Fisheries Division and returned to DOT Environmental Planning Division

- ☒ DEP Fisheries comments have been adequately incorporated into project plans
- ☐ The attached Special Conditions must be incorporated into the contract language

Brian D Murphy
DEP Fisheries Biologist

3/31/14
Date

Samorajczyk, Christopher W

From: Murphy, Brian
Sent: Wednesday, June 11, 2014 1:04 PM
To: Samorajczyk, Christopher W
Subject: RE: 76-193 Root Wad

Importance: Low

Hi Chris,

I checked the site today and we will not have any issue with moving the rootwad to the new proposed downstream location.

Brian D. Murphy, Senior Fisheries Habitat Biologist
Connecticut Department of Energy and Environmental Protection
Inland Fisheries Division
Habitat Conservation and Enhancement Program
209 Hebron Road
Marlborough, CT 06447
Phone: 860-295-9523
Fax: 860-344-2941
brian.murphy@ct.gov



www.ct.gov/deep

*Conserving, improving and protecting our natural resources and environment;
Ensuring a clean, affordable, reliable, and sustainable energy supply.*

From: Murphy, Brian
Sent: Monday, June 09, 2014 10:47 AM
To: Samorajczyk, Christopher W
Subject: RE: 76-193 Root Wad
Importance: Low

Hi Chris,

I will have to see if there is suitable habitat in that area to install the rootwad before I sign off on changing the location. Should be able to get to it within the next week or so.

Regards,
Brian D. Murphy, Senior Fisheries Habitat Biologist
Connecticut Department of Energy and Environmental Protection
Inland Fisheries Division
Habitat Conservation and Enhancement Program
209 Hebron Road
Marlborough, CT 06447
Phone: 860-295-9523
Fax: 860-344-2941
brian.murphy@ct.gov



www.ct.gov/deep

*Conserving, improving and protecting our natural resources and environment;
Ensuring a clean, affordable, reliable, and sustainable energy supply.*

From: Samorajczyk, Christopher W
Sent: Monday, June 09, 2014 8:04 AM
To: Murphy, Brian
Subject: FW: 76-193 Root Wad

Brian-

I just wanted to run something by you before we submitted the permit for project 76-193 over to DEEP. This project is the Hohanum River at the I84 exit 63 off-ramp. DOT Bridge Maintenance is adamant about not having the root wad directly under the bridge (see below), as originally requested and designed. They are requesting it too be installed 300 feet downstream but due to the Route 30 Bridge it was settled on 100 feet downstream (see attachment). Just wanted to run this by you and make sure your OK with the change as your original comment was the root wad should be placed under the off-ramp. If you need any additional information let me know.

Thanks, Chris

From: Stula, Amy E
Sent: Wednesday, June 04, 2014 3:30 PM
To: Zaffetti, Robert P
Cc: Keedy, G Stephen; Arsenault, Joseph D; Samorajczyk, Christopher W; Kelley, Michael F (DESSER)
Subject: RE: 76-193 Root Wad

Good Afternoon Bob,

After speaking with Mike Kelley, Chris Samorajczyk, and Joe Arsenault about this today, it was decided to move the Root Wad location to 100 feet past the abutment at the outlet instead of underneath the bridge. This location was agreed upon because Bridge No. 05238 is approx. 300 feet past Bridge No. 05234 and we didn't want to impact the inlet of the next bridge. If you have any other questions or concerns please contact me.

Thanks,
Amy

From: Keedy, G Stephen
Sent: Wednesday, June 04, 2014 8:54 AM
To: Stula, Amy E
Cc: Zaffetti, Robert P
Subject: FW: 76-193 Root Wad

Ok I don't know what Root Wad is, and I don't want to. Please take care of this.

From: Zaffetti, Robert P
Sent: Tuesday, June 03, 2014 4:02 PM
To: Keedy, G Stephen
Cc: Masayda, Michael E; Kelley, Michael F
Subject: RE: 76-193 Root Wad

Stephen...please ask the area senior to review and provide Mike with comments. Thanks, Bob

From: Kelley, Michael F
Sent: Tuesday, June 03, 2014 3:50 PM
To: Zaffetti, Robert P; Van Allen, Richard C.
Cc: Zuk, Camil; Samorajczyk, Christopher W; Masayda, Michael E
Subject: FW: 76-193 Root Wad

Bob – I believe you spoke with Mike Masayda about DEEP Fisheries request to have the root wad under the bridge. Is the area indicated in red OK, or do you need the root wad to be beyond the abutments? I'm presuming down stream of the bridge is better than upstream. Rich – Do you want to weigh in on this.

Thanks – Mike Kelley

<< File: PER-02_Root Wad - Copy.pdf >>

From: Zuk, Camil
Sent: Tuesday, June 03, 2014 2:49 PM
To: Kelley, Michael F
Subject: FW: 76-193 Root Wad

Mike,

How close can we go to the bridge deck?

From: Samorajczyk, Christopher W
Sent: Tuesday, June 03, 2014 2:40 PM
To: Zuk, Camil
Subject: RE: 76-193 Root Wad

Is Bridge Maintenance concerned with the proposed root wad catching river debris? If the root wad absolutely cannot be placed beneath the off-ramp than it should be placed as close to the structure as possible downstream. The reasoning behind the original placement is for shade and cooling factors during the low flow periods. Let me know if this works

Thanks, Chris

From: Zuk, Camil

Sent: Thursday, May 29, 2014 1:18 PM

To: Samorajczyk, Christopher W

Cc: Arsenault, Joseph D

Subject: 76-193 Root Wad

Chris,

I'm in the process of getting the FM general permit re-signed and it has come up that bridge maintenance is very adamant about not having the root wad directly underneath the bridge as originally directed by Brian Murphy. They want to see the root wad located downstream of the bridge deck. Considering this, what would be the best location to place the root wad? I have attached the original email from Brian and a copy of the plan sheet with a general new proposed area for your reference.

<< File: PER-02_Root Wad.pdf >> << File: 08-08-12 Fisheries Determination DEP to Design.pdf >>

Thanks,

Camil Zuk

Division of Highway Design
Connecticut Department of Transportation
2800 Berlin Turnpike
Newington CT 06111
(860)-594-3366
camil.zuk@ct.gov



Connecticut Department of

**ENERGY &
ENVIRONMENTAL
PROTECTION**

Bureau of Natural Resources

Wildlife Division

Natural History Survey – Natural Diversity Data Base

March 21, 2014

Mr. Christopher Samorajczyk
Connecticut Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06131

Regarding: Site Location: CTDOT 76-193, Manchester - Natural Diversity Data Base
201401273

Dear Mr. Samorajczyk:

In response to your request for a Natural Diversity Data Base (NDDDB) Review of State Listed Species for CTDOT 76-193, Manchester, our records indicate extant populations of species documented on or within the vicinity of the site.

Eastern box turtle (*Terrapene carolina Carolina*) Protection Status: Species of Special Concern

Eastern box turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds. The adults are completely terrestrial but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year. Eastern box turtles have been negatively impacted by the loss of suitable habitat. Some turtles may be killed directly by construction activities, but many more are lost when important habitat areas for shelter, feeding, hibernation, or nesting are destroyed. As remaining habitat is fragmented into smaller pieces, turtle populations can become small and isolated.

Recommendation: Precautions should be taken to protect Eastern box turtles. The following guidelines should be met:

- ✚ Silt fencing should be installed around the work area prior to activity;
- ✚ After silt fencing is installed and prior to work being conducted, a sweep of the work area should be conducted to look for turtles;
- ✚ Workers should be apprised of the possible presence of turtles, and provided a description of the species
(http://www.ct.gov/dep/cwp/view.asp?a=2723&q=473472&depNav_GID=1655);

- ✦ Any turtles that are discovered should be moved, unharmed, to an area immediately outside of the fenced area, and position in the same direction that it was walking;
- ✦ Work conducted during early morning and evening hours should occur with special care not to harm basking or foraging individuals; and
- ✦ All silt fencing should be removed after work is completed and soils are stable so that reptile and amphibian movement between uplands and wetlands is not restricted.

Whiteriver crayfish (*Procambarus acutus*) Protection Status: Species of Special Concern

Whiteriver crayfish inhabit permanent streams, lakes and ponds.

Recommendation: This project could have a negative impact on whiteriver crayfish, therefore best management practices shall be followed to ensure there is no siltation within, or released into Hockanum River.

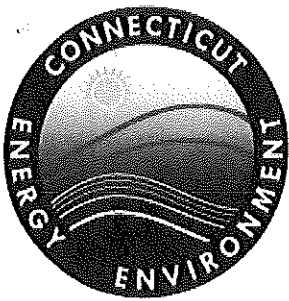
The Natural Diversity Data Base includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available. If the project is not implemented within 12 months, then another Natural Diversity Data Base review should be requested for up-to-date information.

Please be advised that this is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEEP for the proposed site.

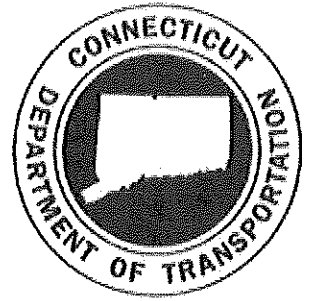
Thank you for consulting the Natural Diversity Data Base. If you have any additional questions, please feel free to contact me at Elaine.Hinsch@ct.gov.

Sincerely,

/s/
Elaine Hinsch
Program Specialist II
Wildlife Division



DEEP / DOT REGULATORY COORDINATION Project Meeting Notes



DOT Project Number: 76-193

Project Description: Interchange 63 at I-84 o / Hockanum River

Town (s): Manchester

Meeting Date (s): 3/28/13;

Fisheries Correspondence Status: 8/2/12 Email from Brian Murphy—recommends rootwads under the Exit 63 off-ramp.

NDDB Correspondence Status: 5/10/12 Eastern Box Turtle (SC) Whiteriver Crayfish (SC)

Department Priority:

Current FDP:

DOT Design Contact: Matt Vail

Project Purpose & Need: see attached project description

Meeting Date #1: - March 28, 2013

Transactions and Determinations: Project site has floodway and stream channel encroachment lines. Bridge work is expected to be able to be accomplished without accessing the River. Inland wetland impact is currently estimated at 0.21 acre. Design is being finalized with Bridge unit. An impact is anticipated to a stormwater basin which serves the stop and shop plaza and hydraulics of this area were discussed in detail. Stormwater improvements are being incorporated into project design. Coordination with fisheries and NDDB has been initiated. DEEP Fisheries is recommending root wads and NDDB concerns can likely be addressed utilizing OEP NTC's and Best Management Practices.

Agency comments:

- Important that stormwater quality features are designed to be consistent with the 2004 Stormwater Quality Manual
- Project qualifies for :
 - Flood Management Certification
 - SCEL utilizing General permit
 - ACOE Category 2

Commitments Reached:

- Continue to follow up with LEAN meeting as design progresses.

DEEP / DOT
Regulatory Coordination Meetings
Project Meeting Notes

Meeting Date #2: - November 20, 2014

Transactions and Determinations: The Project Engineer, Joe Arsenault presented and described the permit plates. These showed the work, permanent and temporary impacts, temporary water handling, critical cross sections, the sediment basin, and planting plans. It was noted that Hockanum River has an associated floodway, however, both the existing and proposed work span it. The watercourse is not being impacted. The water handling shown is not for the watercourse, but for excavation for footings. It was noted that only one water handling stage is anticipated, which will be up the entire time (in first – out last).

Discussion took place as to whether staging plans for bridge construction should also be included with the permit when the confined work would not be changing. Design was concerned that:

- This information is known generally for constructability, but not specifically detailed out at the time that the permit is submitted.
- Contractors often wish to change construction staging, but to include this information in the permit would inhibit that.

Colin (DEEP) understood designer concerns, and felt that for this project it made sense not to do so (construction staging plans are not needed, the construction staging description will need to be added as notes to the permit plan set and the permit application narrative), but that for future projects it should be on a case by case basis. Staging plans should be included if subsequent stages need changes to impacted areas. For all cases, assurances should be provided that the impacts and confined areas should not change from what is shown.

Water handling frequencies and elevations were discussed. Mike Kelley (H&D) showed a report that was an attachment to the permit package and stated that all the information is in there.

OEP stated that they (and DEEP) are just generally looking to see that what is proposed is buildable. The designer stated that constructability is always of prime concern and is examined carefully prior to submitting the permit.

- **Project requires:**
 - Flood Plain Management – General (already obtained)
 - IW - Individual
 - ACOE Category 2

**DEEP / DOT
Regulatory Coordination Meetings
Project Meeting Notes**

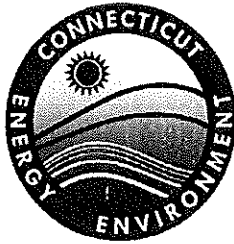
- Stormwater Discharge Registration

Commitments Reached:

- Designer to include a construction staging description in the permit narrative and as notes on the permit plan set.

Attachment AA

Public Notice



Connecticut Department of
Energy & Environmental Protection

**Certification of Notice Form -
Notice of Application**

DEEP USE ONLY

Division
Application No.

I, on behalf of, The Connecticut Department of Transportation, certify that
(Name of Applicant)

the attached notice represents a true copy of the notice that appeared in Hartford Courant
(Name of Newspaper)

on July 22, 2014
(Date)

I also certify that I have provided a copy of said notice to the chief elected municipal official listed below as required by section 22a-6g CGS.

Scott Shanley
Name of Official

General Manager
Title of Official

41 Center Street
Address

Manchester
City/Town

CT
State

06040
Zip Code

Mark W. Alexander
Signature of Applicant

12/4/2014
Date

Mark W. Alexander
Name of Applicant (print or type)

Transp. Assist. Planning Dir.
Title (if applicable)

Affidavit of Publication

State of Connecticut
County of Fairfield

I, Chris Gensur, a billing representative of Graystone Group Advertising, 2710 North Avenue, Suite 200, Bridgeport, CT 06604, do solemnly swear that on:

Date: July 22, 2014

Ad Title: CT DOT - Notice of Permit Application
Town of Manchester

Appeared in: Hartford Courant
publication and the newspaper extracts hereto annexed were clipped from the above named issue of said newspaper.

Subscribed and sworn to this 30th day of July, 2014 before me.

KATHLEEN VITKO
NOTARY PUBLIC
State of Connecticut
My Commission Expires
July 31, 2017

Notary Public
Kathleen Vitko

**NOTICE OF PERMIT APPLICATION
Town of Manchester**

Notice is hereby given that the Connecticut State Department of Transportation (the "applicant") of 2800 Berlin Turnpike, Newington, CT 06111, will submit to the Department of Energy and Environmental Protection an application under Connecticut General Statutes Section 22a-39 (INLAND WETLANDS) AND 401 of the federal Clean Water Act, 33 U.S.C. sec. 1341 (WATER QUALITY CERTIFICATION) for a permit to conduct an activity in a wetland or watercourse and to discharge into waters of the State.

Specifically, the applicant proposes to make improvements at the intersection of the I-84 eastbound Exit 63 on/off-ramps with Routes 30 and 83. These improvements include replacing Bridge No. 05234, which carries the 2-lane Exit 63 off-ramp, with a 4-lane bridge structure. The eastbound approach of Route 30 will be widened to provide an exclusive right-turn lane. The westbound approach of Route 30 will be shifted and widened to align with the new lane arrangements of the eastbound approach. The northbound approach of Route 83 will be widened to provide an additional exclusive left-turn lane. The purpose of these proposed upgrades is to improve the operation and safety at the intersection of Routes 30 and 83 with the I-84 Exit 63 on/off-ramps. The proposed bridge work will result in temporary impacts to the wetlands located immediately adjacent to the existing and proposed bridge abutments. A root wad will be installed along the western bank of the Hockanum River, south of the bridge abutment, resulting in a permanent wetland impact. The purpose of the root wad is to improve fish habitat within the river. An existing riprap lined scour hole located along the eastern bank of the Hockanum River will be replaced with an improved sedimentation trap resulting in a permanent wetland impact. The widening of Route 83 will also result in a permanent wetland impact. The proposed activity will potentially affect 0.155 acres of wetlands.

The name and address of the permit applicant is the Connecticut Department of Transportation, 2800 Berlin Turnpike, Newington, CT 06111.

Interested persons may obtain copies of the application from Mr. Mark W. Alexander, Assistant Transportation Planning Director, Connecticut Department of Transportation, P.O. Box 317546, Newington, CT 06131-7546, telephone (860) 594-2931.

The application will be available for inspection at the Department of Energy and Environmental Protection, Inland Water Resources Division, 79 Elm Street, Hartford, CT 06106-5127, telephone (860) 424-3019, from 8:30 a.m. to 4:30 p.m., Monday through Friday. Please make a reference to State Project No. 76-193. Please call in advance to schedule review of the application.



General Permit Registration Form for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, effective 10/1/13 (non-electronic form)

Prior to completing this form, you **must** read the instructions for the subject general permit available at [DEEP-WPED-INST-015](#).
This form must be filled out electronically before being printed.
You must submit the registration fee along with this form.

The [status of your registration](#) can be checked on the DEEP's ezFile Portal. Please note that DEEP will no longer mail certificates of registration.

CPPU USE ONLY

App #: _____

Doc #: _____

Check #: _____

Program: Stormwater

Part I: Registration Type

Select the appropriate boxes identifying the registration type and registration deadline.

Registration Type		Registration Timeline		
<input checked="" type="checkbox"/>	New Registration (Refer to Section 2 of the permit for definitions of Locally Exempt and Locally Approvable Projects)	<input type="checkbox"/> Locally Approvable Projects Size of soil disturbance:	New registration - Sixty (60) days prior to the initiation of the construction activity for: Sites with a total soil disturbance area of 5 or more acres	
		<input checked="" type="checkbox"/> Locally Exempt Projects Size of soil disturbance: 2.93	<input checked="" type="checkbox"/>	New registration - Sixty (60) days prior to the initiation of the construction activity for: Sites with a total disturbance area of one (1) to twenty (20) acres except those with discharges to impaired waters or tidal wetlands
			<input type="checkbox"/>	New registration - Ninety (90) days prior to the initiation of the construction activity for: (i) Sites with a total soil disturbance area greater than twenty (20) acres, or (ii) Sites discharging to a tidal wetland (that is not fresh-tidal and is located within 500 feet), or (iii) Sites discharging to an impaired water listed in the "Impaired Waters Table for Construction Stormwater Discharges"

Part II: Fee Information

1. New Registrations

a. Locally approvable projects (registration only):

☐ \$625 [#1855]

b. Locally exempt projects (registration and Plan):

☒ \$3,000 total soil disturbance area \geq one (1) and < twenty (20) acres. [#1856]

☐ \$4,000 total soil disturbance \geq twenty (20) acres and < fifty (50) acres. [#1857]

☐ \$5,000 total soil disturbance \geq fifty (50) acres. [#1858]

The fees for municipalities shall be half of those indicated in subsections 1.a., 1.b., and 2 above pursuant to section 22a-6(b) of the Connecticut General Statutes. State and Federal agencies shall pay the full fees specified in this subsection. The registration will not be processed without the fee. The fee shall be non-refundable and shall be paid by certified check or money order payable to the Department of Energy and Environmental Protection.

Part III: Registrant Information

- If a registrant is a corporation, limited liability company, limited partnership, limited liability partnership, or a statutory trust, it must be registered with the Secretary of the State. If applicable, the registrant's name shall be stated **exactly** as it is registered with the Secretary of the State. This information can be accessed at [CONCORD](#).
- If a registrant is an individual, provide the legal name (include suffix) in the following format: First Name; Middle Initial; Last Name; Suffix (Jr, Sr., II, III, etc.).

1. Registrant /Client Name: Ravi V. Chandran, District 1 Engineer

State Agency ↓

Secretary of the State business ID #:

Mailing Address: 1107 Cromwell Avenue

City/Town: Rocky Hill

State: CT

Zip Code: 06511

Business Phone: 860-258-4500

ext.:

Example:(xxx) xxx-xxxx

Contact Person: Ravi V. Chandran, P.E. Title: Dist. Eng.

E-Mail: ravi.chandran@ct.gov

Additional Phone Number (if applicable):

ext.

2. List billing contact, if different than the registrant:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Contact Person:

Title:

Part III: Registrant Information (continued)

3. List primary contact for departmental correspondence and inquiries, if different than the registrant:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Site Phone:

Emergency Phone:

Contact Person:

Title:

Association (e.g. developer, general or site contractor, etc.):

4. List owner of the property on which the activity will take place, if different from registrant:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Contact Person:

5. List developer, if different from registrant or primary contact:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Contact Person:

Title:

6. List general contractor, if different from registrant or primary contact:

Name:

Mailing Address:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Site Phone:

Off Hours Phone:

Contact Person:

Title:

7. List any engineer(s) or other consultant(s) employed or retained to assist in preparing the registration and/or Stormwater Pollution Control Plan. ☐ Please select if additional sheets are necessary, and label and attach them to this sheet.

Name: Joseph Arsenault

Mailing Address: P.O. Box 317546

City/Town: Newington

State: CT

Zip Code: 06131

Business Phone: 860-594-3471

ext.:

Contact Person:

Title: Project Engineer

Service Provided: **Preparation of Stormwater Application and Plans**

Email: joseph.d.arsenault@ct.gov

8. List Reviewing Qualified Professional (for locally approvable projects only). This information must match the information provided in Part IX of this registration.

Name:

Contact Person:

Mailing Address:

Email:

City/Town:

State:

Zip Code:

Business Phone:

ext.:

Part IV: Site Information

1. Site Name: Improvements on I-84 exit 63 EB off-ramp and intersection of Route 30 & Route 83
Street Address or Description of Location: I-84 exit 63 EB off-ramp and intersection of Route 30 & Route 83
(if linear, project location should be the project beginning point)
City/Town: Manchester State: CT Zip Code: 06042
(use only one zip code)
Longitude: 7 2 5 1 7 1 6 Latitude: 4 1 8 1 0 4 5
- Brief Description of construction activity: Realignment and reconstruction of off-ramp bridge and intersection with Route 30 & 83
- Project Start Date (must be on or after the authorization date of this registration) : 04 / 2016
Anticipated Completion Date: 11 / 2017
(month/ yr)
- Normal working hours: **7:30 am** to **4:00 pm**
-
2. MINING: Is the activity on the site in question part of mining operations (i.e. sand and gravel)? ☐ Yes ☒ No
If yes, mining is not authorized by this general permit. You must submit the Registration Form for the General Permit for the Discharge of Stormwater Associated with Industrial Activity.
3. COMBINED OR SANITARY SEWER: Does all of the stormwater from the proposed activity discharge to a combined or sanitary sewer (i.e. a sewage treatment plant)? ☐ Yes ☒ No
If yes, this activity is not regulated by this permit. Contact the Water Permitting & Enforcement Division at 860-424-3018.
4. INDIAN LANDS: Is or will the facility be located on federally recognized Indian lands ☐ Yes ☒ No
5. COASTAL BOUNDARY: Is the activity which is the subject of this registration located within the coastal boundary as delineated on DEEP approved coastal boundary maps ☐ Yes ☒ No
The coastal boundaries fall within the following towns: Branford, Bridgeport, Chester, Clinton, Darien, Deep River, East Haven, East Lyme, Essex, Fairfield, Greenwich, Groton (City and Town), Old Lyme, Guilford, Hamden, Ledyard, Lyme, Madison, Milford, Montville, New London, New Haven, North Haven, Norwalk, Norwich, Old Saybrook, Orange, Preston, Shelton, Stamford, Stonington (Borough and Town), Stratford, Waterford, West Haven, Westbrook and Westport.
If "yes", and this registration is for a new authorization or a modification of an existing authorization where the physical footprint of the subject activity is modified, you must provide documentation the DEEP Office of Long Island Sound Programs or the local governing authority has issued a coastal site plan approval or determined the project is exempt from coastal site plan review. Provide this documentation with your registration as Attachment B. See guidance in Appendix D of the general permit. Information on the coastal boundary is available at the local town hall or at www.cteco.uconn.edu/map_catalog.asp. Additional DEEP Maps and Publications are available by contacting DEEP staff at 860-424-3555.

Part IV: Site Information (continued)

6. ENDANGERED OR THREATENED SPECIES:

In order to be eligible to register for this General Permit, each registrant must perform a self-assessment, obtain a limited one-year determination, or obtain a safe-harbor determination regarding threatened and endangered species. This may include the need to develop and implement a mitigation plan. While each alternative has different limitations, the alternatives are not mutually exclusive; a registrant may register for this General Permit using more than one alternative. See Appendix A of the General Permit. Each registrant must complete this section AND Attachment C to this Registration form and a registrant who does not or cannot do so is not eligible to register under this General Permit.

Each registrant must perform a review of the Department's Natural Diversity Database maps to determine if the site of the construction activity is located within or in proximity (within ¼ mile) to a shaded area.

- a. Verify that I have completed Attachment C to this Registration Form. ☒ Yes
- b. Provide the date the NDDDB maps were reviewed: May 2015 Date of map should be **one** year or less than the submittal date of this application. Print a copy of the NDDDB map you viewed since it must be submitted with this registration as part of Attachment C.
- c. For a registrant using a limited one-year determination or safe harbor determination to register for this General Permit, provide the Department's Wildlife Division NDDDB identification number for any such determination: 201503591 (The number is on the determination issued by the Department's Wildlife Division).

For more information on threatened and endangered species requirements, refer to Appendix A and Section 3(b)(2) of this General Permit, visit the DEEP website at www.ct.gov/deep/nddbrequest or call the NDDDB at 860-424-3011.

7. WILD AND SCENIC RIVERS: Is the proposed project within the watershed of a designated Wild and Scenic River? (See Appendix H for guidance) ☐ Yes ☒ No
8. AQUIFER PROTECTION AREAS: Is the site located within a mapped aquifer protection area www.ct.gov/deep/aquiferprotection as defined in section 22a-354h of the CT General Statutes? (For additional guidance, please refer to Appendix C of the General Permit) ☐ Yes ☒ No
9. CT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL: Is the activity in accordance with CT Guidelines for Erosion and Sediment Control and local erosion & sediment control ordinances, where applicable? ☒ Yes ☐ No
10. HISTORIC AND/OR ARCHAEOLOGICAL RESOURCES:
Verify that the site of the proposed activity been reviewed (using the process outlined in Appendix G of this permit) for historic and/or archaeological resources: ☒ Yes
- a. The review indicates the proposed site does not have the potential for historic/ archaeological resources, OR ☒ Yes ☐ No
- b. The review indicated historic and/ or archaeological resource potential exists and the proposed activity is being or has been reviewed by the Offices of Culture and Tourism, OR ☐ Yes ☒ No
- c. The proposed activity has been reviewed and authorized under an Army Corps of Engineers Section 404 wetland permit. ☐ Yes ☒ No
11. CONSERVATION OR PRESERVATION RESTRICTION:
Is the property subject to a conservation or preservation restriction? ☐ Yes ☒ No

If Yes, proof of written notice of this registration to the holder of such restriction or a letter from the holder of such restriction verifying that this registration is in compliance with the terms of the restriction, must be submitted as Attachment D.

Part V: Stormwater Discharge Information

Table 1

Outfall #	a) Type	b) Pipe Material	c) Pipe Size	d) Note: To find lat/long, go to: CT ECO . A decimal format is required here. Directions on how to use CT ECO to find lat./long. and conversions can be found in Part V, Section d of the DEEP-WPED-INST-015 .		e) What method was used to obtain your latitude/longitude information?
				Longitude	Latitude	
EO_01	pipe	concrete	18"	-7 2.5 1 7 6 8	4 1.8 1 0 8 0	CT ECO
EO_02	pipe	concrete	24"	-7 2.5 1 7 8 4	4 1.8 1 0 2 8	CT ECO
PO_01	other: Trench	not applicable Grass	not applicable	-7 2.5 1 8 3 0	4 1.8 1 1 5 2	CT ECO
EO_04	other: Grass	not applicable Grass	not applicable	-7 2.5 1 8 9 0	4 1.8 1 1 5 0	CT ECO
EO_05	pipe	other: concrete	15"	-7 2.5 1 7 4 7	4 1.8 1 1 2 1	CT ECO

Table 2

Outfall #	a) For temporary and permanent outfalls, provide a start date. For temporary discharges, also provide a date the discharge will cease.	b) For the drainage area associated with each outfall: Effective Impervious Area Before Construction	c) For the drainage area associated with each outfall: Effective Impervious Area After Construction	d) To what system or receiving water does your stormwater runoff discharge? either "storm sewer or wetlands" or "waterbody" (If you select "storm sewer or wetland" proceed to Part VI of the form. If you select "waterbody" proceed to next question)	e) For each outfall, does it discharge to any of the following towns: <i>Branford, Kent, Manchester, Meriden, North Branford, Norwalk, or Wilton?</i> (If no, proceed to Part VI of the form. If yes, proceed to next question.)	f) For each outfall, does it discharge to a "freshwater" or "salt water"? (If you select "freshwater" proceed to Table 3. If you selected "salt water", proceed to Part VI of the form.)
EO_01	04-2016 mm/dd-mm/dd	94040 sq feet	95922 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
EO_02	04-2016 mm/dd-mm/dd	50318 sq feet	50318 sq feet	waterbody	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	freshwater
PO_01	04-2016 mm/dd-mm/dd	20284 sq feet	22564 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
EO_04	04-2016 mm/dd-mm/dd	3450 sq feet	13160 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
EO_05	04-2016 mm/dd-mm/dd	4552 sq feet	8961 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
		next pg: total sq feet	next pg: total sq feet			

Part V: Stormwater Discharge Information Continued

Table 1						
Outfall #	a) Type	b) Pipe Material	c) Pipe Size	d) Note: To find lat/long, go to: CT ECO . A decimal format is required here. Directions on how to use CT ECO to find lat./long. and conversions can be found in Part V, Section d of the DEEP-WPED-INST-015 .		e) What method was used to obtain your latitude/longitude information?
				Longitude	Latitude	
EO_06	pipe	concrete	15"	-7 2.5 1 8 8 4	4 1.8 1 0 9 1	CT ECO
EO_07	pipe	concrete	15"	-7 2.5 1 8 2 6	4 1.8 1 0 7 8	CT ECO
EO_08	pipe	concrete	15"	-7 2.5 1 7 5 9	4 1.8 1 0 6 6	CT ECO
	Select One:	Select One:	Select One:	-	Select One:
	Select One:	Select One:	Select One:	-	Select One:

Table 2						
Outfall #	a) For temporary and permanent outfalls, provide a start date. For temporary discharges, also provide a date the discharge will cease.	b) For the drainage area associated with each outfall: Effective Impervious Area Before Construction	c) For the drainage area associated with each outfall: Effective Impervious Area After Construction	d) To what system or receiving water does your stormwater runoff discharge? either "storm sewer or wetlands" or "waterbody" (If you select "storm sewer or wetland" proceed to Part VI of the form. If you select "waterbody" proceed to next question)	e) For each outfall, does it discharge to any of the following towns: <i>Branford, Kent, Manchester, Meriden, North Branford, Norwalk, or Wilton?</i> (If no, proceed to Part VI of the form. If yes, proceed to next question.)	f) For each outfall, does it discharge to a "freshwater" or "salt water" ? (If you select "freshwater" proceed to Table 3. If you selected "salt water", proceed to Part VI of the form.)
EO_06	04-2016 mm/dd-mm/dd	14576 sq feet	14576 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
EO_07	04-2016 mm/dd-mm/dd	17874 sq feet	18130 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
EO_08	04-2016 mm/dd-mm/dd	20341 sq feet	20671 sq feet	storm sewer or wetland	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
	- mm/dd-mm/dd	sq feet	sq feet	Select one:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
	- mm/dd-mm/dd	sq feet	sq feet	Select one:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Select one:
		225435 total sq feet	244302 total sq feet			

Part V: Stormwater Discharge Information (continued)

Table 3 Provide the following information about the receiving water(s)/wetland(s) that receive stormwater runoff from your site:			
Outfall #	a) What is your 305b ID # (water body ID #)? (Section 3.b, of the DEEP-WPED-INST-015 , explains how to find this information)	b) Is your receiving water identified as a impaired water in the " Impaired Waters Table for Construction Stormwater Discharges "? If yes, proceed to next question. If no, proceed to Part VI: Pollution Control Plan.	c) Has any Total Maximum Daily Load (TMDL) been approved for the impaired water?
EO_02	4500-00	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N
		<input type="checkbox"/> Y <input type="checkbox"/> N	<input type="checkbox"/> Y <input type="checkbox"/> N

Part V: Stormwater Discharge Information (continued)

Impaired waters: If you answered "yes" to Table 3, question b., **verify** that the project's Pollution Control Plan (Plan) addresses the control measures below in Question 1 or 2, as appropriate.

1. If the impaired water does not have a TMDL, confirm compliance by selecting 1.a. or 1.b. below:

a. No more than 3 acres is disturbed at any time;

☐ Yes

OR

b. Stormwater runoff from a 2 yr, 24 rain event is **retained**.

☐ Yes

2. If the impaired water has a TMDL, confirm compliance by selecting 2.a. and 2.b. below and either question 2.c.1. or 2.c.2. below:

a. The Plan documents there is sufficient remaining Waste Load Allocations (WLA) in the TMDL for the proposed discharge,

☐ Yes

AND

b. Control measures shall be implemented to assure the WLA will not be exceeded,

☐ Yes

AND

c. 1. Stormwater discharges will be monitored for the indicator pollutant identified in the TMDL,

☐ Yes

OR

2. The Plan documents specific requirements for stormwater discharges specified in the TMDL.

☐ Yes

Part VI: Pollution Control Plan (select one of the following three categories)

☒ I am registering a Locally Exempt project and submitting the required electronic Plan (in Adobe™ PDF or similar publically available format) pursuant to Section 3(c)(2)(E) of this permit. (If you do not have the capability to submit the Plan electronically please call 860-418-5982).

☒ Plan is attached to this registration form

☐ Plan is available at the following Internet Address (URL):

☐ I am registering a Locally Approvable project and have chosen not to submit the Plan with this registration pursuant to Section 3(c)(1) of this permit.

☐ I am registering a Locally Approvable project and have chosen to make my Plan electronically available pursuant to Section 4(c)(2)(N) of this permit.

☐ Plan is attached to this registration form

☐ Plan is available at the following Internet Address (URL):

Part VII: Registrant Certification

The registrant *and* the individual(s) responsible for actually preparing the registration must sign this part. A registration will be considered incomplete unless all required signatures are provided.

For New Registrants:

" I hereby certify that I am making this certification in connection with a registration under such general permit,
[INSERT NAME OF REGISTRANT BELOW]

submitted to the commissioner by Ravi V. Chandran, P.E. for

[INSERT ADDRESS OF PROJECT OR ACTIVITY BELOW]

an activity located at I-84 exit 63 EB off-ramp at the intersection of route 30 and route 83 and that all terms and conditions of the general permit are being met for all discharges which have been initiated and such activity is eligible for authorization under such permit. I further certify that a system is in place to ensure that all terms and conditions of this general permit will continue to be met for all discharges authorized by this general permit at the site. I certify that the registration filed pursuant to this general permit is on complete and accurate forms as prescribed by the commissioner without alteration of their text. I certify that I have personally examined and am familiar with the information that provides the basis for this certification, including but not limited to all information described in Section 3(b)(8)(A) of such general permit, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining such information, that the information upon which this certification is based is true, accurate and complete to the best of my knowledge and belief. I certify that I have made an affirmative determination in accordance with Section 3(b)(8)(B) of this general permit. I understand that the registration filed in connection with such general permit is submitted in accordance with and shall comply with the requirements of Section 22a-430b of Connecticut General Statutes. I also understand that knowingly making any false statement made in the submitted information and in this certification may be punishable as a criminal offense, including the possibility of fine and imprisonment, under Section 53a-157b of the Connecticut General Statutes and any other applicable law."

For Re-registrants:

" I hereby certify that I am making this certification in connection with a registration under the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, submitted to the commissioner
[INSERT NAME OF REGISTRANT BELOW]

by [REDACTED] for an activity located at
[INSERT ADDRESS OF PROJECT OR ACTIVITY BELOW]

[REDACTED] and that all terms and conditions of the general permit are being met for all discharges which have been initiated and such activity is eligible for authorization under such permit. I further certify that all designs and plans for such activity meet the current terms and conditions of the general permit in accordance with Section 5(b)(5)(C) of such general permit and that a system is in place to ensure that all terms and conditions of this general permit will continue to be met for all discharges authorized by this general permit at the site. I certify that the registration filed pursuant to this general permit is on complete and accurate forms as prescribed by the commissioner without alteration of their text. I certify that I have personally examined and am familiar with the information that provides the basis for this certification, including but not limited to all information described in Section 3(b)(8)(A) of such general permit, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining such information, that the information upon which this certification is based is true, accurate and complete to the best of my knowledge and belief. I also understand that knowingly making any false statement made in the submitted information and in this certification may be punishable as a criminal offense, including the possibility of fine and imprisonment, under Section 53a-157b of the Connecticut General Statutes and any other applicable law."

Signature of Registrant (Must be an original signature, not a copy or fax)	Date
Ravi V. Chandran, P.E.	District Engineer
Name of Registrant (print or type)	Title (if applicable)
Signature of Preparer (if different than above) (Must be an original signature, not a copy or fax)	Date
Joseph D. Arsenault, P.E.	Project Engineer
Name of Preparer (print or type)	Title (if applicable)

Part VIII: Professional Engineer (or Landscape Architect, where appropriate) Design Certification
(for publically approvable and exempt projects)

The following certification must be signed by a Professional Engineer or Landscape Architect where appropriate.

<p>"I hereby certify that I am a professional engineer licensed in the State of Connecticut. I am making this certification in connection with a registration under such general permit, submitted to the commissioner by [INSERT NAME OF REGISTRANT BELOW]</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; width: 60%;">Ravi V. Chandran, P.E.</div> for an activity located at [INSERT ADDRESS OF PROJECT OR ACTIVITY BELOW] <div style="border: 1px solid black; padding: 2px; display: inline-block; width: 80%;">Improvements on I-84 exit 63 EB off-ramp and intersection of Route 30 & Route 83</div>	
<p>I certify that I have thoroughly and completely reviewed the Stormwater Pollution Control Plan for the project or activity covered by this certification. I further certify, based on such review and on the standard of care for such projects, that the Stormwater Pollution Control Plan has been prepared in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, the Stormwater Quality Manual, as amended, and the conditions of the general permit, and that the controls required for such Plan are appropriate for the site. I further certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining such information, that the information upon which this certification is based is true, accurate, and complete to the best of my knowledge and belief. I also understand that knowingly making any false statement in this certification may subject me to sanction by the Department and/or be punishable as a criminal offense, including the possibility of fine and imprisonment, under section 53a-157b of the Connecticut General Statutes and any other applicable law."</p>	
Signature of Design Professional (Must be an original signature, not a copy or fax)	Date
Name of Professional (print or type)	Title
Mailing Address	City/Town
State	Business Phone
Zip Code	
	License #
Affix P.E./L.A Stamp Here	

Part IX: Reviewing Qualified Professional Certification

The following certification must be signed by a) a Conservation District reviewer OR, b) a qualified soil erosion and sediment control and/or professional engineer

☐ **Review certification by Conservation District:**

1.) District: list of districts

Date of Affirmative Determination:

"I am making this certification in connection with a registration under General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, submitted to the commissioner

[INSERT NAME OF REGISTRANT BELOW]

by

[INSERT ADDRESS OF PROJECT OR ACTIVITY BELOW]

I have personally examined and am familiar with the information that provides the basis for this certification, and I affirm, based on the review described in Section 3(b)(11)(C) of this general permit and on the standard of care for such projects, that the Stormwater Pollution Control Plan is adequate to assure that the activity authorized under this general permit will comply with the terms and conditions of such general permit and that all stormwater management systems: (i) have been designed to control pollution to the maximum extent achievable using measures that are technologically available and economically practicable and that conform to those in the Guidelines and the Stormwater Quality Manual; (ii) will function properly as designed; (iii) are adequate to ensure compliance with the terms and conditions of this general permit; and (iv) will protect the waters of the state from pollution."

Signature of District Professional and Date (Must be an original signature, not a copy or fax)

Name of District Professional and License Number (if applicable)

Or

☐ **Review certification by Qualified Professional**

Company: _____

Name: _____

License #: _____

Level of independency of professional:

Required for all projects disturbing over 1 acre:

1. I verify I am not an employee of the registrant. ☐ Yes
2. I verify I have no ownership interest of any kind in the project for which the registration is being submitted. ☐ Yes

Required for projects with 15 or more acres of site disturbance (in addition to questions 1&2):

3. I verify I did not engage in any activities associated with the preparation, planning, designing or engineering of the soil erosion and sediment control plan or stormwater management systems plan for this registrant. ☐ Yes
4. I verify I am not under the same employ as any person associated with the preparation, planning, designing or engineering of the soil erosion and sediment control plan or stormwater management systems plan for this registrant. ☐ Yes

Part IX: Reviewing Qualified Professional Certification (continued)

"I hereby certify that I am a qualified professional engineer or qualified soil erosion and sediment control professional, or both, as defined in the General Permit for Discharge of Stormwater and Dewatering Wastewaters from Construction Activities and as further specified in Sections 3(b)(11)(A) and (B) of such general permit. I am making this certification in connection with a registration under such general permit,

[INSERT NAME OF REGISTRANT BELOW]

submitted to the commissioner by

[INSERT ADDRESS OF PROJECT OR ACTIVITY BELOW]

for an activity located at

I have personally examined and am familiar with the information that provides the basis for this certification, including but not limited to all information described in Section 3(b)(11)(C) of such general permit, and I certify, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining such information, that the information upon which this certification is based is true, accurate and complete to the best of my knowledge and belief. I further certify that I have made the affirmative determination in accordance with Sections 3(b)(11)(D)(i) and (ii) of this general permit. I understand that this certification is part of a registration submitted in accordance with Section 22a-430b of Connecticut General Statutes and is subject to the requirements and responsibilities for a qualified professional in such statute. I also understand that knowingly making any false statement in this certification may be punishable as a criminal offense, including the possibility of fine and imprisonment, under Section 53a-157b of the Connecticut General Statutes and any other applicable law."

Signature of Reviewing Qualified Professional

(Must be an original signature, not a copy or fax)

Date: _____

Name of Reviewing Qualified Professional

License No.: _____

Affix P.E./L.A. Stamp Here

Part X: Supporting Documents

Select the applicable box below for each attachment being submitted with this registration form. When submitting any supporting documents, please label the documents as indicated below (e.g., Attachment A, etc.) and be sure to include the registrant's name as indicated on this certification form.

- ☒ **Attachment A:** Select here as verification that an 8 ½" X 11" copy of the relevant portion of a USGS Quadrangle Map with a scale of 1:24,000, showing the exact location of the facility has been submitted with this registration. Indicate the quadrangle name on the map, and be sure to include the registrant's name. (To obtain a copy of the relevant USGS Quadrangle Map, call your town hall or DEEP Maps and Publications Sales at 860-424-3555)
- ☐ **Attachment B:** Documentation related to *Coastal Consistency Review*, if applicable.
- ☒ **Attachment C:** Threatened and Endangered Species Form and any additional information (such as a copy of a NDDB map)
- ☐ **Attachment D:** Conservation or Preservation Restriction Information, if applicable.
- ☒ **Attachment E:** Where applicable, non-electronic Pollution Control Plan.

Note: Please submit the fee along with a completed, printed and signed Registration Form and all additional supporting documents to:

**CENTRAL PERMIT PROCESSING UNIT
DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127**

ATTACHMENT C: THREATENED AND ENDANGERED SPECIES

Information about compliance with the requirements of Section 3(b)(2) of this general permit, regarding threatened and endangered species, is in Appendix A of the general permit. Choose one or more (if applicable) of the following in order to be eligible to register for this General Permit. A registrant who does not or cannot do so is not eligible to register under this General Permit.

☐ Self Assessment using the NDDDB maps – Select this only if:

- a. The site of the construction activity is not entirely, partially or within a ¼ mile of a shaded area depicted on the Department's Natural Diversity Database maps and this determination was made not more than six months before the date of submitting this registration;

AND

- b. The entity registering for this General Permit has no reasonably available verifiable scientific, or other credible information that the construction activity could reasonably be expected to have an adverse impact upon a federal or state species listed as threatened or endangered.

Attach a copy of the NDDDB map used to conduct the self assessment used to register for this general permit.

Note: Both a and b as used in this section, must be true in order for a Registrant to register for this General Permit using the self-assessment option. If neither is true, a Registrant cannot use the self-assessment option to comply with Section 3(b)(2) and Appendix A of the General Permit.

☒ Limited One-Year Determination – Select this only if:

- a. The entity registering for this General Permit has obtained a limited one-year determination from the Department's Wildlife Division regarding threatened and endangered species: i) within a year of the date of submitting this registration; or ii) more than 1 year before submitting this registration, but such determination has been extended by the Department within one year of the date of submitting this registration;

AND

- b. The Registrant has provided to the Department's Wildlife Division any reasonably available verifiable scientific, or other credible information that the construction activity could reasonably be expected to have an adverse impact upon a federal or state species listed as threatened or endangered.

Provide the date the limited one-year determination was issued by the Department's Wildlife Division May 23, 2015;

or

Provide the date that the most recent extension to a limited one year determination was issued by the Department's Wildlife Division _____.

Note: Both a and b as used in this section, must be true in order for a Registrant to register for this General Permit using the Limited One-Year Determination option. If a Limited One-Year Determination or extension to any such determination was issued by the Department's Wildlife Division more than one year before the submission of this registration, a Registrant cannot use any such determination or extension to comply with Section 3(b)(2) and Appendix A of the General Permit.

ATTACHMENT C: THREATENED AND ENDANGERED SPECIES (continued)

- ☐ **Select here if the Limited One-Year Determination issued by the Department includes a Mitigation Plan.**

Provide the date the Mitigation Plan was approved: _____

Governmental Entity Approving the Plan: _____

As of the date this Registration is submitted,

Has the Mitigation Plan been fully implemented? ☐ Yes ☐ No

Date commenced: _____ Date completed: _____

Is the Mitigation Plan partially implemented? ☐ Yes ☐ No

If yes, what actions have been taken? _____

And which actions are yet to be implemented and what is the timeframe for completion of such actions: _____

Is the Mitigation Plan yet to be implemented? ☐ Yes ☐ No

If yes, specify the timeframe for implementation: _____ to _____

And summarize actions to be implemented: _____

- ☐ **Safe Harbor Determination - Select this only if:**

- a. The entity registering for this General Permit has obtained a Safe Harbor Determination from the Department's Wildlife Division regarding threatened and endangered species: i) within 3 years of the date of submitting this registration; or ii) more than 3 years before submitting this registration, but within one-year of a one-year extension issued by the Department's Wildlife Division to a safe harbor determination;

AND

- b. The entity registering for this General Permit has provided to the Department's Wildlife Division any reasonably available verifiable scientific, or other credible information that the construction activity could reasonably be expected to have an adverse impact upon a federal or state species listed as threatened or endangered.

Provide the date the Department's Wildlife Division issued a Safe Harbor Determination: _____

If applicable, provide the date that any one-year extension to a Safe Harbor Determination was issued by the Department's Wildlife Division: _____.

Note: Both a and b as used in this section, must be true in order for a Registrant to register for this General Permit using the Safe Harbor Determination option. If a Safe Harbor Determination was issued by the Department's Wildlife Division more than three years before the submission of this registration, and has not been extended, a Registrant cannot use any such safe harbor to comply with section 3(b)(2) and Appendix A of this General Permit. If a Safe Harbor Determination was granted and extended for one-year, more than four years before the submission of this registration, a Registrant cannot use any such Safe Harbor Determination to comply with Section 3(b)(2) and Appendix A of the general permit.

ATTACHMENT C: THREATENED AND ENDANGERED SPECIES (continued)

- ☐ **Select here if the safe harbor noted above includes a Mitigation Plan.**

Provide the date the Mitigation Plan was approved: _____

Governmental Entity Approving the Plan: _____

As of the date this Registration is submitted,

Has the Mitigation Plan been fully implemented? ☐ Yes ☐ No

Date commenced: _____ Date completed: _____

Is the Mitigation Plan partially implemented? ☐ Yes ☐ No

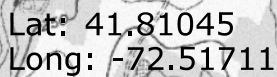
If yes, what actions have been taken? _____

And which actions are yet to be implemented and what is the timeframe for completion of such actions: _____

Is the Mitigation Plan yet to be implemented? ☐ Yes ☐ No

If yes, specify the timeframe for implementation: _____ to _____

And summarize actions to be implemented: _____



Boundary of site



38

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Registrant:
Ravi V. Chandran, P.E.
District 1 Engineer

CITY/TOWN: Manchester



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Improvements on I-84 EB Exit 63 On/Off-Ramp and Intersection of Routes 30 & 83

OFFICE OF
ENGINEERING


DATE:

ATTACHMENT A

Natural Diversity Data Base Areas

MANCHESTER, CT

December 2014

 State and Federal Listed Species
& Significant Natural Communities

 Town Boundary

NOTE: This map shows general locations of State and Federal Listed Species and Significant Natural Communities. Information on listed species is collected and compiled by the Natural Diversity Data Base (NDDB) from a number of data sources. Exact locations of species have been buffered to produce the general locations. Exact locations of species and communities occur somewhere in the shaded areas, not necessarily in the center. A new mapping format is being employed that more accurately models important riparian and aquatic areas and eliminates the need for the upstream/downstream searches required in previous versions.

This map is intended for use as a preliminary screening tool for conducting a Natural Diversity Data Base Review Request. To use the map, locate the project boundaries and any additional affected areas. If the project is within a shaded area there may be a potential conflict with a listed species. For more information, complete a Request for Natural Diversity Data Base State Listed Species Review form (DEP-APP-007), and submit it to the NDDB along with the required maps and information. More detailed instructions are provided with the request form on our website.

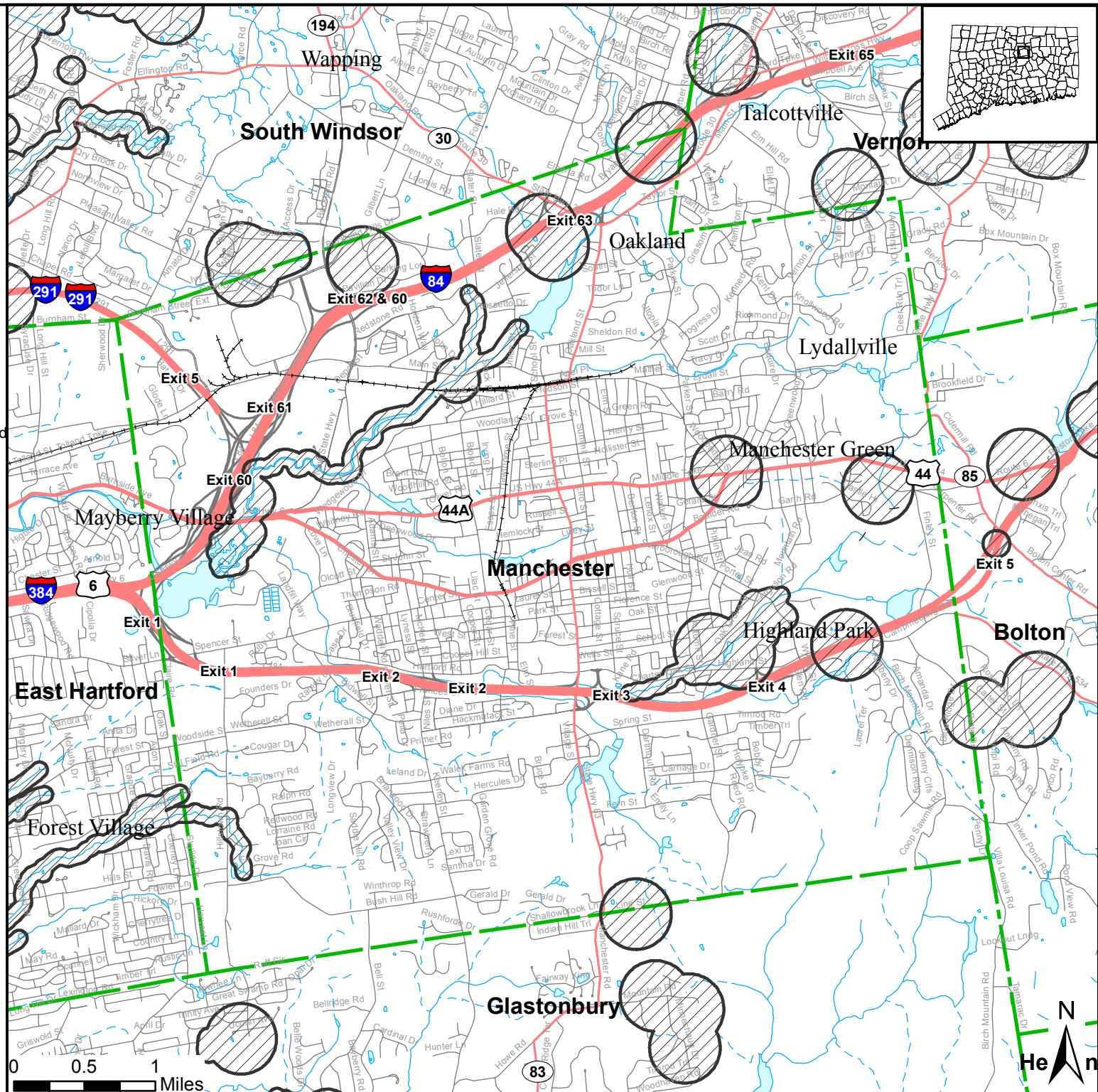
www.ct.gov/deep/nddbrequest

Use the CTECO Interactive Map Viewers at www.cteco.uconn.edu to more precisely search for and locate a site and to view aerial imagery with NDDB Areas.

QUESTIONS: Department of Energy and Environmental Protection (DEEP)
79 Elm St., Hartford CT 06106
Phone (860) 424-3011



Connecticut Department of
Energy & Environmental Protection
Bureau of Natural Resources
Wildlife Division



STORMWATER POLLUTION CONTROL PLAN

Improvements on I-84 exit 63 EB off-ramp and intersection of Route 30 & Route 83 Manchester, CT

State Project No.: 0076-0193



Connecticut Department of Transportation

District 1
1107 Cromwell Avenue
Rocky Hill, CT 06067

9 July 2015

This Stormwater Pollution Control Plan (SPCP) is prepared to comply with the requirements for the General Permit for Stormwater Discharges (GPSD) from Construction Activities. Also to be considered part of the SPCP are the proposed construction plans, special provisions, and the Connecticut Department of Transportation's "Standard Specifications for Roads, Bridges and Incidental Construction" (Form 816) including supplements thereto and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

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1. Site Description

Site Description

Proposed project No. 76-193 is located in Manchester at the Intersection of the I-84 eastbound Exit 63 Off-ramp (MP_71.60) and Routes 30 (MP_6.17) and 83 (MP_10.14), both multi-lane principal urban arterials. The intent of this project is to improve the operation and safety where Routes 30 and 83 intersect with the I-84 Exit 63 On/ Off-ramp. Within the project limits there are three existing bridges that carry state roadways over the Hockanum River. There is a FEMA Flood Hazard Zone AE and a FEMA Floodway associated with this portion of the Hockanum River. The proposed project will remove existing Br. No. 05234 which carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River and construct a new bridge structure to carry the proposed realigned Exit 63 Off-Ramp over the river. Bridge No. 05238, which carries Route 30 over the Hockanum River, will have the deck structure slightly modified however the supporting substructure of the existing structure will not be impacted. Bridge No. 05235 which carries the existing I-84 Exit 63 On-Ramp over the Hockanum River will not be hydraulically impacted by the proposed project.

A full realignment and reconstruction of the Exit 63 Off-ramp is proposed. Existing Bridge No. 05234 carries the I-84 Exit 63 Off-Ramp alignment over the Hockanum River. Realigning the Off-ramp will require removing the existing bridge and constructing a new structure to carry the realigned Exit Ramp. The existing bridge abutments are outside of the FEMA 100-yr floodplain and Floodway. Constructing the proposed replacement structure for Br. No. 05234 will involve placing new abutments directly upstream and in general, in-line with the existing abutments. The existing abutments will be removed down to ground level. There is a FEMA Flood Hazard Zone AE and a FEMA Floodway associated with this portion of the Hockanum River. The FEMA Floodplain and Floodway limits are coincident in the vicinity of the Exit 83 Off-Ramp Structures. The Flood Insurance Study's Floodway Data Table 16 indicates the floodway is 79ft wide within the reach that includes the existing and proposed Bridge No. 05234. The proposed bridge structure will span 85ft. as measured perpendicular to the flow of the Hockanum River channel, exceeding the width of the FEMA 100-year floodplain and floodway.

Bridge No. 05238 carries Route 30 over the Hockanum River. Bridge No. 05238 is located approximately 340ft downstream of Bridge No. 05234. The bridge deck of Bridge No. 05238 will be structurally modified to allow reconfiguring the Route 30 lane alignment. All work on Bridge No. 05238 will be done from the Bridge deck. The existing bridge abutments are outside of the FEMA 100-yr floodplain and Floodway limits. There will be no impact, either permanent or temporary to the FEMA regulated area below the subject bridge.

Bridge No. 05235 is located approximately 210ft upstream of Bridge No. 05234 and carries the existing I-84 Exit 63 On-Ramp over the Hockanum River. No alterations to the structure of Br. No. 05235 are proposed. The hydraulics of Br. No. 05235 will not be impacted by the proposed project.

The purpose of this project is to improve the operation and safety at the intersection of Routes 30 and 83 with I-84 Exit 63 eastbound on/off-ramps. The existing alignment of the off-ramp consists of three simple curves, each progressively sharper than the other. The current ratio between successive curves is not in compliance with Departmental guidelines. The lack of storage capacity has been known to cause queued vehicles to back up onto I-84. This complex curvature also creates a short stopping sight distance. This is evidenced by the large number of rear end collisions at this location including high speed crashes on the I-84 mainline.

Site work includes full reconstruction and realignment of the off-ramp and minor alignment changes and widening to the on-ramp. Widening of the eastbound approach of Route 30, at the intersection with Route 83, to accommodate an exclusive right turn lane will require modifications to Bridge No. 05238 over the Hockanum River. Field measurements were taken to confirm that by removing the sidewalk on the north side, a seven-lane cross-section (five approaching, two departing) could be provided without widening the bridge. The westbound approach of Route 30 will be realigned with the eastbound approach, and the northbound approach of Route 83 will be widened for an additional lane.

Access to Hockanum River Linear Park Trail: a delineated stone dust path will be constructed to provide access to the existing multi-use park trail that parallels the Hockanum River within the project limits. This path will be accessed from the western limit of the project on westbound Route 30.

An infiltration trench is being installed along the south side of the new off-ramp to mitigate the increased runoff post-construction. The trench has been designed to reduce the post-construction runoff rate below the pre-construction runoff rate infiltrating 22% of the Water Quality Flow (0.514 cfs).

Existing and proposed storm drainage systems drain to the Hockanum River.

Estimated Disturbed Area

The total area for this project site is 6.08 acres. Within the site, 2.93 acres of erodible area will be disturbed by construction activities.

Estimated Runoff Coefficient

The estimated runoff coefficient (C) for the existing site is 0.43 for the total site area of 13.57 acres. The estimated runoff coefficient (C) for the proposed site is 0.44 for the total site area of 14.28 acres.

See Table 1 and Table 2 for individual drainage area details. See Appendix A for plan drawings of the contributing drainage areas.

Table 1: Pre Construction Drainage Areas

System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
A	IN1	113+25LT	0.48	0.77	5	EO_01 A-P11-O
A	IN2	112+00LT	0.38	0.71	5	EO_01 A-P11-O
A	IN3	111+50LT	0.16	0.90	5	EO_01 A-P11-O
A	IN4	110+50LT	0.17	0.58	5	EO_01 A-P11-O
A	IN5	300+75RT	0.56	0.74	5	EO_01 A-P11-O
A	IN6	302+50RT	0.37	0.51	5	EO_01 A-P11-O
A	IN7	109+00LT	0.02	0.84	5	EO_01 A-P11-O
A	IN8	219+40RT	0.83	0.67	5	EO_01 A-P11-O
		Total Area--->	2.97	0.69	<---Weighted Avg. Coeff	
System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
B	IN1	405+00RT	0.11	0.88	5	EO_02 B-P1-O
B	IN2	404+50LT	0.10	0.89	5	EO_02 B-P1-O
B	IN3	400+00RT	3.23	0.27	12	EO_02 B-P1-O
B	IN4	401+00LT	0.43	0.89	5	EO_02 B-P1-O
B	P1	405+25RT	3.49	0.15	12	EO_02 B-P1-O
B	P3	406+00LT	0.11	0.15	5	EO_02 B-P1-O
		Total Area--->	7.47	0.26	<---Weighted Avg. Coeff	
System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
A1a	IN1a Grass	214+00RT	1.65	0.36	13	IN1a Grass EO_03
A1b	IN1b Grass	216+00RT	0.17	0.50	5	IN1b Grass EO_04
C	IN1	218+00RT	0.10	0.90	5	C-P1-O
D	IN1	103+00LT	0.33	0.90	5	D-P1-O
E	IN1	104+50LT	0.41	0.90	5	E-P1-O
F	IN1	106+00LT	0.47	0.89	5	F-P1-O
		Total Area--->	3.13	0.59	<---Weighted Avg. Coeff	

Table 2: Post-Construction Drainage Areas

System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
A	IN1	113+25LT	0.48	0.73	5	EO_01 A-P12-O
A	IN2	112+00LT	0.38	0.65	5	EO_01 A-P12-O
A	IN3	111+50LT	0.15	0.66	5	EO_01 A-P12-O
A	IN4	110+50LT	0.18	0.60	5	EO_01 A-P12-O
A	IN5	300+75RT	0.56	0.88	5	EO_01 A-P12-O
A	IN6	302+50RT	0.37	0.44	5	EO_01 A-P12-O
A	IN8	219+50RT	0.91	0.69	5	EO_01 A-P12-O
		Total Area-->	3.03	0.69	<--Weighted Avg. Coeff	
System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
B	IN1	405+00RT	0.11	0.88	5	EO_02 B-P1-O
B	IN2	404+50LT	0.10	0.89	5	EO_02 B-P1-O
B	IN3	400+00RT	3.23	0.27	12	EO_02 B-P1-O
B	IN4	401+00LT	0.43	0.89	5	EO_02 B-P1-O
B	P1	405+25RT	3.49	0.15	12	EO_02 B-P1-O
B	P5	406+00LT	0.11	0.15	5	EO_02 B-P1-O
		Total Area-->	7.47	0.26	<--Weighted Avg. Coeff	
System No.	Inlet No.	Station	Drainage Area (ac)	C, Runoff Coefficient	Tc, Time of Concentration (min)	Outfall No.
A1a	IN1a Trench	214+25RT	1.80	0.37	13	INFIL. TRENCH PO_01
A1b	IN1b Grass	216+00RT	0.53	0.58	9	IN1b Grass EO_04
C	IN1	218+00RT	0.21	0.90	5	EO_05 C-P1-O
D	IN1	103+00LT	0.33	0.90	5	EO_06 D-P1-O
E	IN1	104+00LT	0.42	0.90	5	EO_07 E-P1-O
F	IN1	106+00LT	0.47	0.89	5	EO_08 F-P1-O
		Total Area-->	3.76	0.60	<--Weighted Avg. Coeff	

Receiving Waters

Existing and proposed storm drainage systems drain to the Hockanum River.

Extent of Wetlands on Site

The following required permits have been applied for: Inland Wetlands & Watercourses, 401 Water Quality Certificate, and Flood Management General Certification. There are three regulated inland wetland sites affected by construction activities with a total regulated area impact of 0.156 acres (6,799 sq. ft.).

SITE 1: I-84 EASTBOUND EXIT 63 OFF-RAMP BRIDGE (BRIDGE NO. 05234)

The project involves a full realignment and reconstruction of the off-ramp to a simple curve allowing for a 30 mph design speed. This includes minor alignment changes to the on-ramp and widening the off-ramp. The new off-ramp alignment will require the replacement of the existing bridge (Site 1) and will require environmental permits for temporary impacts to the Inland Wetlands and FEMA Floodplain and Floodway. At the request of DEEP-Fisheries, a root-wad will be installed in the bank of the Hockanum River, approximately 75 feet south of the proposed bridge. Only temporary impacts are required at Site 1 totaling 0.101 acres. The impacts are required to perform proper water handling in order to excavate for the new bridge abutments along both the north and south side of the Hockanum River.

An infiltration trench is being installed from Sta. 213+00 to Sta. 214+25 Right to mitigate the increased runoff from the new off-ramp. The trench has been designed to reduce the post-construction runoff rate below the pre-construction runoff rate infiltrating 22% of the Water Quality Flow (0.514 cfs).

SITE 2: OUTLET PROTECTION STA. 219+75, 112' Right

The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time causing it to be delineated as an inland wetland. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel, reduce water velocity before flowing the remaining way to the Hockanum River (Site 2), and provide storage for 32% of the Water Quality Volume (7,275 ft³). The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

SITE 3: ROUTE 83 FILL EMBANKMENT

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side, which would avoid any impacts to utility poles and provide proper alignment with the on-ramp. However, widening on the east side will permanently impact wetlands (Site 3) between Sta. 404+25 and Sta. 406+50 Right. A temporary wetland impact is also required for a temporary work area in order to install the drainage appurtenances at Sta. 405+25 Right. The total amount of permanent and temporary wetland impact is 0.050 acres. This includes 0.038 acres of permanent wetland impact and 0.012 acres of temporary wetland impact.

Several alternatives were considered during the preliminary design stage of the project to minimize the effects to adjacent inland wetlands.

FEMA FLOODPLAINS

The bridge abutments will be founded on bedrock, and the Hockanum River channel is heavily riprapped so scour under the 100-year and 500-yr conditions are not a concern.

The proposed bridge structure of Bridge No. 05234 will span 85ft. as measured perpendicular to the flow of the Hockanum River channel, exceeding the width of the FEMA 100-year floodplain and floodway.

Approximately 340ft downstream of existing Bridge No. 05234 is Bridge No. 05238 which carries Route 30 over the Hockanum River. Bridge No. 05238 will have its deck structure slightly modified to allow reconfiguring the lanes however the lower portion of the abutments will not be impacted and the hydraulics of the existing structure will not be changed.

Approximately 210ft upstream of existing Bridge No. 05234 is Bridge No. 05235. Bridge No. 05235 carries the existing I-84 Exit 63 On-Ramp over the Hockanum River. No alterations to the structure of Br. No. 05235 are proposed. The hydraulics of Br. No. 05235 will not be impacted by the proposed project.

The proposed project does not permanently impact the channel and floodplain areas below the FEMA 100-yr water surface elevation.

2. Construction Sequencing

The contractor will have the ability, and the responsibility, to perform the work in phases, so as to minimize disturbance at any one time, minimize disruption to the town and state roadway system, minimize disruption to local businesses, and perform the work in an efficient manner. It is the contractor's responsibility to determine the limit of each phase of work, and comply with the maximum disturbance criteria.

Each phase of construction, regardless of the number of sequences it contains, requires a preconstruction meeting that should include ConnDOT, the contractor, utility representatives, and other agents who have responsibility and authority for the implementation, operation, monitoring and maintenance of the erosion and sediment (E&S) controls. The purpose of the preconstruction meeting is to make all responsible parties aware of the project's needs so that resources can be properly distributed and to identify limitations and restrictions. The preconstruction meeting shall identify modifications needed to the construction sequence and application of special treatments. Included in the preconstruction meeting agenda, at a minimum, shall be a review of plans, permit conditions, the contractors' sequence and schedules for construction, site restrictions and other special needs.

The following sequence is provided as a generic roadway construction guideline applicable for each individual phase. This generic phasing shall be adjusted, by the contractor, to meet project specific phase needs and conditions. It is also recognized that work will not proceed without delays. When work is suspended within a phase, the contractor shall deploy additional erosion and sediment controls as may be required to secure the site. Erosion and sediment controls shall be installed and maintained as dictated by the plan set (Erosion and Sedimentation Control Sheets) and Section 5.0 (Controls) of this Plan. If additional erosion and sediment controls are required due to specific site conditions, it is the contractor's responsibility to provide controls that are sufficient to prevent the removal and transportation of sediment off site to resource areas, that area also satisfactory to the Engineer.

The generic sequence of construction activities for each phase will generally occur as follows:

1. Preconstruction meeting.
2. Install Erosion and Sediment Controls.
3. Perform clearing and grubbing activities.
4. Staged construction activities. (see proposed staging below)
5. Stabilize area.
6. Remove Erosion and Sediment Controls.

In order to give the contractor the maximum amount of flexibility, the plans show locations of perimeter erosion control barriers. It is the contractor's responsibility to provide additional controls within the project limits to prevent the removal and transportation of sediment off site and to resource areas. In accordance with ConnDOT Form 816 Best Management Practices (Section 1.10.03 – Water Pollution Control), no construction shall proceed until (i) the Contractor has submitted in writing to the Engineer its erosion and sedimentation control plan (for each phase); (ii) the Engineer has given in writing his approval of said plans; and (iii) the Contractor has installed all erosion and sedimentation controls called for by said plans. If the construction sequencing activities create an area of disturbance between two (2) acres and five (5) acres per each discharge point, the contractor must submit to the engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sediment trap installed prior to each discharge point with a capacity to contain 134 cubic yards per acre of material in accordance with the 2002 Guidelines. The contractor shall provide an inspection and maintenance plan for the temporary sediment trap as part of the amended SWPCP.

The tentative staging proposed by ConnDOT for improvements on I-84 exit 63 EB off-ramp and intersection of route 30 and route 83 is provided as follows:

STAGE 1

Section 1 (Off-ramp: North of Hockanum River):

1. Install temporary impact attenuation system, temporary precast concrete barrier curb, and anti-tracking pad.
2. Install sedimentation control system and water handling system
3. Construct bridge abutment, deck and parapets. (see structure sheets)

4. Install full depth pavement structure with the exception of the final pavement lift.
5. Complete finished grading, planting and turf establishment adjacent to new pavement structure
6. Install guide rail

Section 2 (Off-ramp: South of Hockanum River):

1. Remove existing island; remove catch basin and pipe; install full depth pavement to existing grade of adjacent roadway.
2. Install temporary pavement markings and signs (see traffic plans)
3. Remove guide rail along the east shoulder of the exit 63 off ramp (south of the existing bridge). Install all temporary precast concrete barrier curb.
4. Remove guide rail located along the west shoulder of the exit 63 on-ramp and install new guide rail at this location and impact attenuation system.
5. Install anti-tracking pad
6. Install sedimentation control system and water handling system
7. Construct bridge abutment, deck and parapets.
8. Install the full depth pavement structure with the exception of the final pavement lift on the off-ramp.
9. Complete finished grading, planting, turf establishment, install guide rail along east side of off-ramp, and remove anti-tracking pad.
10. Remove temporary barrier.

STAGE 2

1. Maintain water handling system and sedimentation control system installation.
2. Complete grading and paving (except final lift) at beginning of new ramp.
3. Begin removing guide rail at existing bridge and anchor PCBC to parapet as soon as bridge approach rail has been removed.
4. Proceed by removing existing guide rail and installing PCBC in its place.
5. Remove splitter island during night work.

STAGE 3

1. Maintain water handling system installation and install sedimentation control system.
2. Install temporary PCBC.
3. Demolish existing bridge.
4. Construct abutments, bridge deck, and parapets.
5. Install catch basins.
6. Install sediment trap and infiltration trench.
7. Remove water handling system and complete final grading.
8. Install off ramp guide rail.
9. Complete full depth pavement (except final lift).

STAGE 4

1. Shift traffic.
2. Install silt fence, temporary precast concrete barrier curb, and crash barrier.
3. Remove existing catch basins.
4. Complete widening.
5. Remove sidewalk and complete bridge work.
6. Complete drainage system work and outlet cleaning.
7. Complete paving (except final course).

STAGE 5

1. Install granite curbing and guide rail along western portion of route 30.
2. Install silt fence and shift traffic.
3. Realign edge of road and install granite curbing.
4. Begin sidewalk and sidewalk ramp work.
5. Complete final grading and turf establishment.

STAGE 6

1. Remove splitter island.
2. Install silt fence and shift traffic.
3. Complete drainage system modifications and install granite curbing.
4. Install sidewalk and guide rail.
5. Install pavement structure with exception of final lift.
6. Complete final grading and turf establishment.

STAGE 7

1. Complete drainage system work.
2. Install traffic islands.

The anticipated project construction schedule is from January, 2016 through August, 2017.

3. Control Measures

Erosion and Sedimentation Controls

CT DOT will have construction inspection personnel assigned to the project in order to oversee the Contractor's operations to ensure compliance with the provisions of the Standard Specifications. Further CT DOT oversight is provided by the District 1 Environmental Coordinator and the Office of Environmental Planning.

The following timelines will be followed for the proposed construction activities:

- If construction activities are complete or have been temporarily halted for more than seven (7) days, stabilization activities will be implemented within three (3) days.
- Areas that remain disturbed but inactive for at least 30 days shall receive temporary seeding or soil protection within seven (7) days.
- Disturbed areas that do not establish a vegetative cover within 30 days of seeding shall have erosion control blankets installed. Prior to the erosion control blanket installation, the soil would be prepared with the application of lime, fertilizer, and seed.
- Areas that will be disturbed past the planting season will be covered with a long-term, non-vegetative stabilization method that will provide protection through the winter.
- Stabilization practices will be implemented as quickly as possible in accordance with the Guidelines.
- The Contractor shall stabilize disturbed areas with temporary or permanent measures as quickly as possible after the land is disturbed. Requirements for soil stabilization are detailed in Form 816 Section 1.10.03, Best Management Practices.

Soil Stabilization and Protection

Temporary Stabilization Practices

- Erosion Control Matting: On slopes steeper than 2:1 erosion control matting shall be used to stabilize the topsoil.
- Silt Fence: Silt fence shall be placed at the base of embankment
- Anti-Tracking Pads: Construction entrances (gravel anti-tracking pads) shall be constructed at truck access points to off-road Route.
- Dust Control: Routine sweeping and application of dust suppression agents, including

water and calcium chloride, over exposed subbase shall be completed for dust control.

- Hay Bales: Hay Bales shall be used where necessary in accordance with the 2002 Connecticut Erosion and Sedimentation Guidelines.

Stabilization practices shall be implemented no more than three days after completion, as final grades are reached, or if work has been suspended for more than seven days.

Temporary seeding shall be spread over any disturbed areas which will remain inactive for at least 30 days. Areas to remain disturbed through winter shall be protected with non-vegetative stabilization measures. The Contractor must provide an Erosion and Sedimentation Control plan for each winter season during construction operations.

The Contractor may use other controls in the project as necessary if they conform to the 2002 Connecticut Erosion and Sedimentation Guidelines and are approved by the Engineer. The contractor will be required to provide the necessary details for any erosion controls not specifically called for on the project plans.

During construction, all areas disturbed by the construction activity that have not been stabilized, structural control measures, and locations where vehicles enter or exit the site shall be inspected at least once every seven calendar days. These areas shall also be inspected within 24 hours following any storm in which 0.5 inches or greater of rain occurs.

Permanent Stabilization Practices

All new embankments disturbed by construction and unpaved areas that are graded or disturbed by construction will receive landscaping, erosion control matting, topsoil and/or turf establishment. The Contractor may use other permanent stabilization practices approved by the Engineer and conforming to Connecticut's Erosion and Sedimentation Control Guidelines (2002).

Structural Measures

Evolving site conditions will determine what structural measures are necessary, and the following general principles should be applied to their selection and placement:

- Prevent clean water from becoming turbid, by diverting runoff from upslope areas away from disturbed areas. Earth dikes, temporary swales, perimeter dike/swales, or diversions that outlet in stable areas can be used in this capacity.
- Remove sediment from turbid water before the water leaves the site. The method of sediment removal depends upon how the water drains from the site. Concentrated flow must be diverted to a trapping device so that suspended sediment can be deposited. Dikes or swales that outlet into traps or basins can accomplish this. A storm drain system may be used to convey concentrated sediment laden water only if the system empties into a

trap or basin. Otherwise, all storm drain inlets must be protected so that sediment laden water cannot enter the drainage system before being treated to remove the sediment.

- Surface runoff draining in sheet flow must be controlled and treated before the water leaves the site. Straw bale dikes, silt fences, or vegetative buffer strips can be used to treat sheet flow.
- All practices designed and implemented must be properly maintained in order to remain functional. Sediment accumulated in basins and traps must be removed and disposed of in a manner that stabilizes them on the construction site.

Maintenance

All construction activities and related activities shall conform to the requirements of Section 1.10 "Environmental Compliance" of ConnDOT's Standard Specifications, Form 816. In general, all construction activities shall proceed in such a manner so as not to pollute any wetlands, watercourses, water body, and conduit carrying stormwater. The Contractor shall limit, in so far as possible, the surface area of earthen materials exposed by construction activity and immediately provide temporary and permanent pollution control to prevent soil erosion and contamination on the site. Water pollution control provisions and best management practices per Section 1.10.03 of the Standard Specifications shall be administered during construction. Control measures shall be inspected and maintained in accordance with the 2002 Guidelines and as directed by the Engineer.

4 Dewatering Wastewaters

Dewatering Guidelines

If encountered, dewatering wastewaters will be infiltrated into the ground unless otherwise directed by the Engineer. When dewatering is necessary, pumps used shall not be allowed to discharge directly into a wetland or watercourse. Prior to any dewatering, the Contractor must submit to the Engineer a written proposal for specific methods and devices to be used, and must obtain the Engineer's written approval of such methods and devices, including, but not limited to, the pumping of water into a temporary sedimentation basin, providing surge protection at the inlet or outlet of pumps, floating the intake of a pump, or any other method for minimizing and retaining the suspended solids. If the Engineer determines that a pumping operation is causing turbidity problems, the Contractor shall halt said operation until a means of controlling the turbidity is submitted by the Contractor in writing to the Engineer, approved in writing by the Engineer and implemented by the Contractor. No discharge of dewatering wastewater shall contain or cause visible oil sheen, floating solids or foaming in the receiving water. If required, all activities are to be performed in compliance with ConnDOT Form 816.

SITE 1: I-84 EASTBOUND EXIT 63 OFF-RAMP BRIDGE (BRIDGE NO. 05234)

Only temporary wetlands impacts are required at Site 1 totaling 0.101 acres. The impacts are required to perform proper water handling in order to excavate for the new bridge abutments

along both the north and south side of the Hockanum River. The water handling plans require sand bags to be installed confining all excavation, bridge construction, and roadway construction to be completed with one water handling stage. All grading will be reestablished to match the existing conditions once the construction activities are over.

The suggested construction sequence begins by installing the sedimentation control system and the sand bag water handling system. Work can then proceed constructing the northern portion of the off-ramp and new bridge. Once completed, the southern portion of the bridge and off-ramp can be constructed. All work associated with the construction of the new bridge, including the construction of the northern portion of the bridge, the construction of the southern portion of the bridge, and the removal of the existing bridge shall be completed within the sand bag water handling system. Finally, after all bridge construction is completed the sand bag water handling system can be removed and all final grading around the abutments completed.

SITE 2: OUTLET PROTECTION STA. 219+75, 112' Right

Minor drainage modifications will be required to align the drainage structures at the new edge of pavement throughout the project. The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time, causing it to be delineated as an inland wetland. Trees and brush have grown throughout the riprap outlet channel and water discharging from the outlet has washed a well-defined channel through the sediment and down to the Hockanum River. Due to the reduction in paved surfaces throughout this drainage system, the 10 yr. flow discharging from the outlet has been reduced from 14.8 cfs down to 14.2 cfs. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel. The sediment trap will also reduce the discharge velocity of the water.

The total amount of wetland impact at Site 2 is 0.004 acres and is all permanent impact required to provide for the improvements to the outlet protection.

Sedimentation and erosion controls will be installed prior to the start of work. Allowable time periods for unconfined and confined in-stream work provided by DEEP will determine when the Contractor will be allowed to work within wetland limits. Best Management Practices are required to set up and remove cofferdams and dewatering systems.

All disturbed areas will be reestablished per the planting plan. All activities will be performed in the dry and in accordance with Section 1.10, Environmental Compliance and Best Management Practices of the Department's Standard Specifications for Construction, Form 816.

SITE 3: ROUTE 83 FILL EMBANKMENT

The northbound approach of Route 83 will be widened by one lane. The widening is proposed on the east side to avoid any impacts to utility poles along the west side and provide proper alignment with the on-ramp. Widening on the east side will permanently impact wetlands between Sta. 404+25 and Sta. 406+50 Right and will require a slope easement for support of the highway from the adjacent property. A temporary work area is also required in order to install the drainage appurtenances at Sta. 405+25 Right. Although the plans do not indicate any

proposed activities within the Temporary Work Area, it will be provided to allow room for water handling and access to the inlet of the 15 inch pipe if required.

Approximately 115 c.y. of fill will be placed in the wetland along the eastern side of Route 83 from Sta. 404+25 and Sta. 406+50 Right to provide for the widening and support of the roadway. The total amount of permanent and temporary wetland impact is 0.050 acres. This includes 0.038 acres of permanent wetland impact for the placement of the fill described above and 0.012 acres of temporary wetland impact for the temporary work area.

5. Post-Construction Stormwater Management

Post-construction Guidelines

After the project is complete, the Department will perform the following maintenance and restorative measures:

- Litter/debris will be removed from the site regularly.
- Mowing and maintenance of the turf areas and vegetated areas will occur as needed.
- Riprap outlet protection will be inspected and repaired annually or as needed.
- The sediment trap will be inspected and repaired annually or as needed. Sediment will be removed when it interferes with the operation of the trap. Outlets will be checked for excessive scour and repaired as needed.

Post Construction Performance Standards

An infiltration trench is being installed along the south side of the new off-ramp to mitigate the increased runoff post-construction. The trench has been designed to reduce the post-construction runoff rate below the pre-construction runoff rate infiltrating 22% of the Water Quality Flow (0.514 cfs).

The existing modified riprap channel at the 18 inch R.C.C.E. located at Sta. 219+75, 112' Right has filled in with sediment over time causing it to be delineated as an inland wetland. This riprap channel will be excavated to provide a sediment trap that will offer better removal of sediment than the current riprap channel, reduce water velocity before flowing the remaining way to the Hockanum River (Site 2), and provide storage for 32% of the Water Quality Volume (7,275 ft³).

Suspended Solids and Floatables Removal:

In addition to the infiltration trench and sediment trap, catch basins will be installed with sumps where appropriate, barring any utility or ledge conflicts.

6. Other Controls

Waste Disposal

Construction site waste shall be properly managed and disposed of during the entire construction period. Additionally,

- Waste collection and disposal shall be in accordance with Best Management Practices, Section 1.10.03-2 of Form 816.
- Waste collection shall be scheduled regularly to prevent the containers from overfilling.
- Spills shall be cleaned up immediately.
- Defective containers that may cause leaks or spills will be identified through regular inspection. Any found to be defective will be repaired or replaced immediately.
- Any stockpiling of materials should be confined to the designated area as defined by the engineer.

Washout Areas

Washout of applicators, containers, vehicles and equipment for concrete shall be conducted in a designated washout area. No surface discharge of washout wastewaters from the area will be allowed. All concrete washwater will be directed into a container or pit such that no overflows can occur. Washout shall be conducted in an entirely self-contained system and will be clearly designed and flagged or signed where necessary. The washout area shall be located outside of any buffers and at least 50 feet from any stream, wetland or other sensitive water or natural resources as determined or designated by CTDOT Office of Environmental Planning.

The designated area shall be designed and maintained such that no overflows can occur during rainfall or after snowmelt. Containers or pits shall be inspected at least once a week to ensure structural integrity, adequate holding capacity and will be repaired prior to future use if leaks are present. The contractor shall remove hardened concrete waste when it accumulates to a height of ½ of the container or pit or as necessary to avoid overflows. All concrete waste shall be disposed of in a manner consistent with all applicable laws, regulations and guidelines.

Anti-tracking Pads and Dust Control

Off-site vehicle tracking of sediments and the generation of dust shall be minimized. Temporary anti-tracking pads from the active work site to the existing pavement will be installed and maintained at the locations shown on the plans. The contractor shall:

- Maintain the entrance in a condition which will prevent tracking and washing of sediment onto paved surfaces.
- Provide periodic top dressing with additional stone or additional length as conditions demand.
- Repair any measures used to trap sediment as needed.

- Immediately remove all sediment spilled, dropped, washed or tracked onto paved surfaces.
- Ensure roads adjacent to a construction site are left clean at the end of each day.

If the construction entrance is being properly maintained and the action of a vehicle traveling over the stone pad is not sufficient to remove the majority of the sediment, then the contractor shall either:

- Increase the length of the construction entrance,
- Modify the construction access road surface, or
- Install washing racks and associated settling area or similar devices before the vehicle enters a paved surface.

For construction activities which cause airborne particulates, wet dust suppression shall be utilized. Construction site dust will be controlled by sprinkling the ground surface with water until it is moist on an as-needed basis. The volume of water sprayed shall be such that it suppresses dust yet also prevents the runoff of water.

Post-Construction

Upon completion of construction activities and stabilization of the site, all post-construction stormwater structures, including the infiltration trench and sediment trap, shall be cleaned of construction sediment and any remaining silt fence shall be removed prior to acceptance of the project by CTDOT. Sediment shall be properly disposed of in accordance with all applicable laws, regulations and guidelines.

Maintaining and Storing Vehicles and Equipment

The contractor shall take measures to prevent any contamination to wetlands and watercourses while maintaining and storing construction equipment on the site. All chemical and petroleum containers stored on site shall be provided with impermeable containment which will hold at least 110% of the volume of the largest container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area. All chemicals and their containers shall be stored under a roofed area except for those stored in containers of 100 gallon capacity or more, in which case double-walled tanks will suffice.

7. Inspections

Inspection Guidelines

All construction activities shall be inspected initially for Plan implementation and then weekly for Routine Inspections.

During construction, all areas disturbed by the construction activity that have not been stabilized,

all erosion and sedimentation control measures, all structural control measures, soil stockpile areas, washout areas and locations where vehicles enter or exit the site shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and impacts to receiving waters at least once every seven calendar days and within 24 hours of the end of a storm that generates a discharge.

For storms that end on a weekend, holiday or other time in which working hours will not commence within 24 hours, an inspection is required within 24 hours only for storms that equal or exceed 0.5 inches. For lesser storms, inspection shall occur immediately upon the start of subsequent normal working hours.

Where sites have been temporarily or finally stabilized, such inspection shall be conducted at least once every month for three months.

Qualified personnel provided by the DOT District 1 Office shall conduct Inspections.

Items to be inspected: the following items shall be inspected as described below:

<u>Item</u>	<u>Procedure</u>
Silt Fence	Silt fence shall be inspected to ensure that the fence line is intact with no breaks or tears. The fence shall be firmly anchored to the ground. Areas where the fence is excessively sagging or where support posts are broken or uprooted shall be noted. Depth of sediment behind the fence shall be noted.
Catch Basin Protection	Protective measures shall be inspected to ensure that sediment is not entering the catch basins. Catch basin sumps shall be monitored for sediment deposition. Hay bales shall be inspected to ensure they have not clogged.
Vehicle Entrances / Exits	Locations where vehicles enter or exit the site shall be inspected for evidence of off-site tracking.
General	Construction areas and the perimeter of the site shall be inspected for any evidence of debris that may blow or wash off site or that has blown or washed off site. Construction areas shall be inspected for any spills or unsafe storage of materials that could pollute off site waters.

Following each inspection, the Qualified Inspector will prepare a report that will summarize the

following:

- The scope of the inspection.
- Name(s) and qualifications of personnel making the inspection.
- The date(s) of the inspection.
- Weather conditions including precipitation information.
- Major observations relating to erosion and sediment controls and the implementation of the SWPCP.
- A description of the stormwater discharge(s) from the site.
- Any water quality monitoring performed during the inspection.

The report will include a statement that, in the judgment of the Qualified Inspector(s) conducting the Routine Inspection, the site is either in compliance or out of compliance with the terms and conditions of this SWPCP and General Permit. If the site inspection indicates that the site is out of compliance, the inspection report will include a summary of the remedial actions required to bring the site back into compliance. Non-engineered corrective actions (as identified in the 2002 Guidelines) will be implemented on site within 24 hours and incorporated into a revised SWPCP within three (3) calendar days of the date of inspection unless another schedule is specified in the 2002 Guidelines. Engineered corrective actions (as identified in the 2002 Guidelines) shall be implemented on site within seven (7) days and incorporated into a revised SWPCP within ten (10) days of the date of inspection, unless another schedule is specified in the 2002 Guidelines or is approved by DEEP. During the period in which any corrective actions are being developed and have not yet been fully implemented, interim measures will be implemented to minimize the potential for the discharge of pollutants from the site.

8. Keeping Plans Current

Revisions to Stormwater Pollution Control Plans:

CTDOT shall amend the Plan if the actions required by the Plan fail to prevent pollution or otherwise comply with provisions of the General Permit. The Plan shall also be amended whenever there is a change in contractors or sub-contractors at the site. If the results of the inspections require modifications to the Stormwater Pollution Control Plan, the plans shall be revised as soon as practicable after the inspection. Such modifications shall provide for a timely implementation of any changes to non-engineered controls on the site within 24 hours and implementation of any changes to the plan within 3 (three) calendar days following the inspection. For Engineered measures, corrective actions shall be implemented on site within 7 (seven) days and incorporated into a revised Plan within 10 (ten) days of the date of inspection.

In no event shall the requirements to keep the Plan current or update a Plan, relieve the permittee and their contactor(s) of the responsibility to properly implement any actions required to protect the waters of the State and to comply with all conditions of the permit.

9. Monitoring Requirements

A written report summarizing the scope of the inspection, the name(s) and qualifications of inspection personnel, the date and time of the inspection, major observations relative to the implementation of the Pollution Control Plan, and actions taken shall be completed within 24 hours of the inspection. This report shall be retained as part of the Stormwater Pollution Control Plan for at least five years after the date of the inspection.

Turbidity monitoring shall be conducted at all discharge locations utilizing a procedure consistent with 40 CFR Part 136 (http://www.epa.gov/region9/qa/pdfs/40cfr136_03.pdf) and may be taken manually or by an in-situ turbidity probe or other automatic sampling device equipped to take individual turbidity readings. The first sample shall be taken within the first hour of stormwater discharge from the site and at least three grab samples shall be taken during a storm event and shall be representative of the flow and characteristics of the discharge. Sampling shall be conducted at least monthly when there is a discharge of stormwater from the site while construction activity is ongoing, until final stabilization of the drainage area associated with each outfall is achieved.

Samples shall be taken during normal working hours. If a storm continues past working hours, sampling shall resume the following morning or the morning of the next working day following a weekend or Holiday, as long as the discharge continues. Sampling may be temporarily suspended when conditions exist that may reasonably pose a threat to the safety of the person taking the sample.

Within 30 days following the end of each month, the stormwater sampling results shall be submitted on the Stormwater Monitoring Report (SMR) and submit in accordance with Net DMR. If there is no stormwater discharge during a month, sampling is not required, however, SMR's indicating "no discharge" shall still be submitted as required.

10. Contractors

General

This section shall identify all Contractors and Subcontractors who will perform on site actions which may reasonably be expected to cause or have the potential to cause pollution of the waters of the State.

Certification Statement

All contractors and subcontractors must sign the attached statement. All certifications will be included in the Stormwater Pollution Control Plan.

State Project No. 0076-0193

**Improvements on I-84 exit 63 EB off-ramp
and intersection of Route 30 & Route 83
Manchester, CT**

The following Certification Statement applies to this SWPCP. All project participants who are involved with “site” construction (e.g. Construction Manager, General Contractor, Contractor, Subcontractors, etc.) are required to certify to this plan by signing in the space provided. By signing, each project participant certifies the following:

“I certify under penalty of law that I have read and understand the terms and conditions of the general permit for the discharge of stormwater associated with construction activity. I understand that as Contractor on the project, I am covered by this general permit, and must comply with the terms and conditions of this permit, including, but not limited to, the requirements of the Stormwater Pollution Control Plan prepared for this project.”

1	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
2	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
3	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>

4	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
5	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
6	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
7	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>
8	<div>Signature</div> <div>Printed Name</div> <div>Date</div>	<div>On behalf of (company):</div> <div>Telephone number:</div> <div>Responsible for (project role):</div>

General:

This Stormwater Pollution Control Plan (SPCP) is prepared to comply with the requirements for the General Permit for Stormwater Discharges (GPSD) from Construction Activities. Also to be considered part of the SPCP are the proposed construction plans, special provisions, and the Connecticut Department of Transportation's "Standard Specifications for Roads, Bridges and Incidental Construction" (Form 816) including supplements thereto and the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control and 2004 Stormwater Quality Manual.

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Appendix E – Notice of Termination Form

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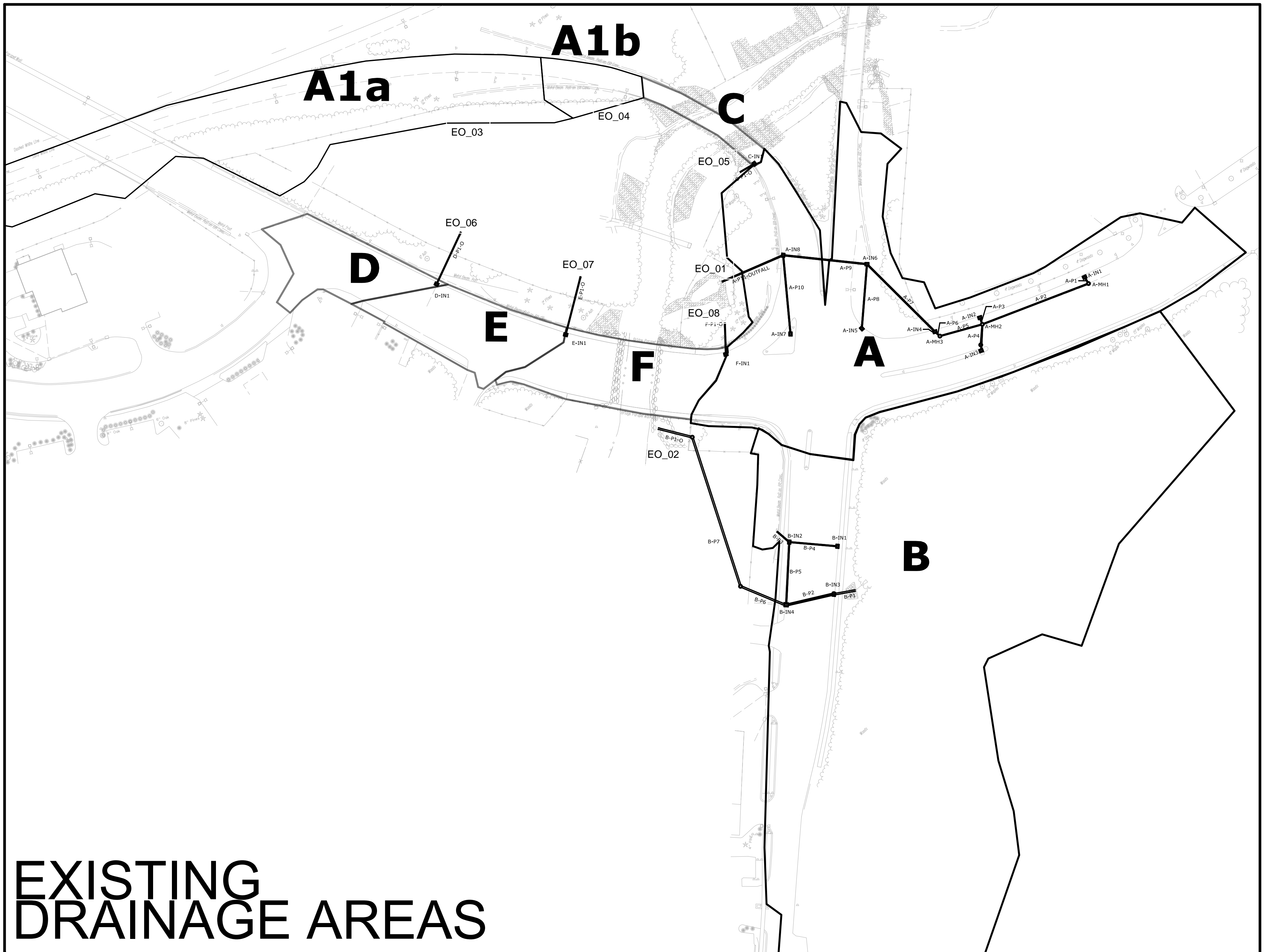
**Figure 1 – Aerial Photo, I-84 exit 63 EB off-ramp
and intersection of Route 30 & Route 83
Manchester, CT**



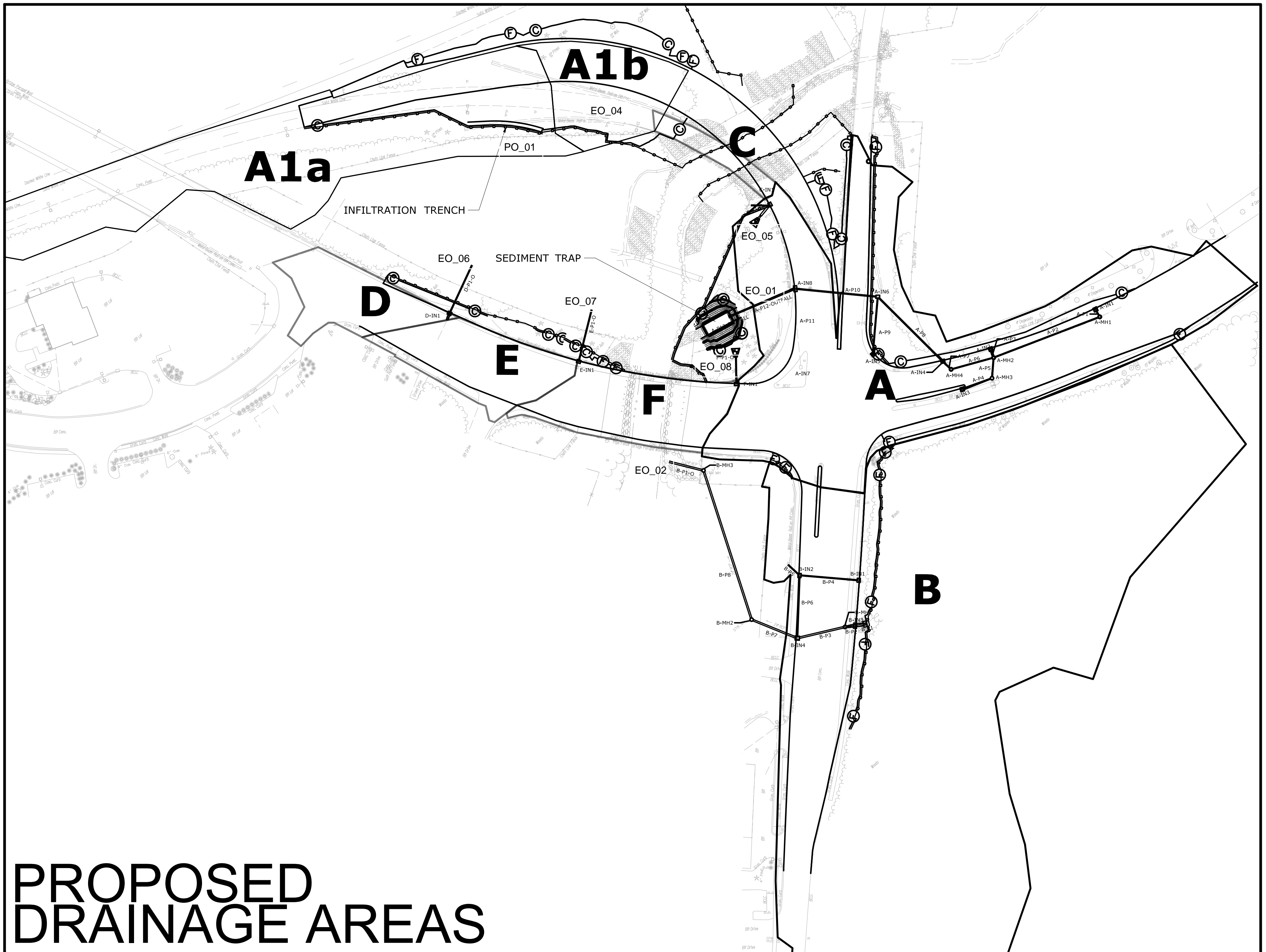


EXISTING SITE





EXISTING DRAINAGE AREAS



PROPOSED DRAINAGE AREAS



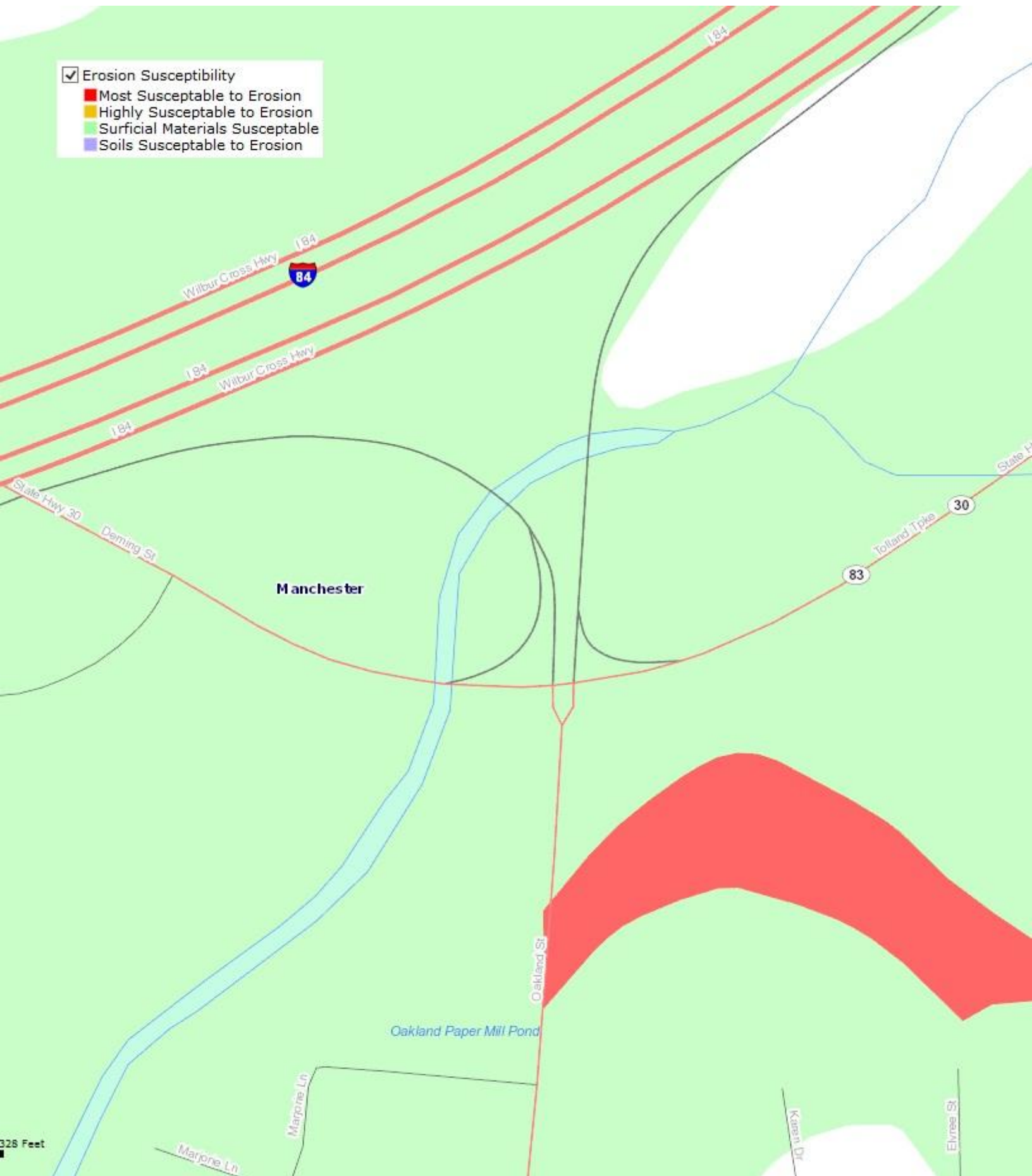
38

APPLICAT



OFFICE OF
ENGINEER

A-06



Drainage Reports

Element Type: **Area**

Date: Monday, June 16, 2014 10:16:19 AM

Drainage Data File: **Existing_Drainage**

ID	AttachTo	Area (ac)	RunoffCoef	TimeofConc (min)	Intensity (in/h)	Peak (cfs)
A1	A-IN8	0.83	0.67	5.00	6.00	3.33
A2	A-IN6	0.37	0.52	5.00	6.00	1.16
A3	A-IN5	0.56	0.81	5.00	6.00	2.73
A4	A-IN3	0.16	0.83	5.00	6.00	0.81
A5	A-IN4	0.17	0.49	5.00	6.00	0.51
A6	A-IN2	0.38	0.76	5.00	6.00	1.74
A7	A-IN1	0.48	0.80	5.00	6.00	2.30
A8	A-IN7	0.02	0.90	5.00	6.00	0.12
A1a	EO_03 IN1a	1.65	0.36	13.00	4.30	2.55
A1b	EO_04 -	0.17	0.50	5.00	6.00	0.51
B1	B-IN3	3.23	0.38	12.00	4.50	5.52
B2	-	3.49	0.30	12.00	4.50	4.72
B3	B-IN4	0.43	0.89	5.00	6.00	2.27
B4	-	0.11	0.30	5.00	6.00	0.19
B5	B-IN2	0.11	0.89	5.00	6.00	0.56
B6	B-IN1	0.11	0.88	5.00	6.00	0.60
C1	C-IN1	0.10	0.90	5.00	6.00	0.56
D1	D-IN1	0.33	0.90	5.00	6.00	1.81
E1	E-IN1	0.41	0.90	5.00	6.00	2.22
F1	F-IN1	0.47	0.89	5.00	6.00	2.49

Number of items reported: 20

Element Type: Pipe

Date: Monday, June 16, 2014 10:15:45 AM

Drainage Data File: Existing_Drainage

Pipe ID	TC (min)	Intensity (in/h)	SumCA (ac)	TotalFlow (cfs)	Shape	Size (in)	Material	n	Pipe Length (ft)	InvertIn (ft)	InvertOut (ft)	Slope (%)	Capacity (cfs)	Velocity (ft/s)
A-P1	5.02	6.00	0.27	1.61	Circular	15.00	RCP	0.012	6.23	168.60	168.13	7.57	19.25	9.50
A-P2	6.37	6.00	0.27	1.61	Circular	15.00	RCP	0.012	144.54	167.63	167.51	0.08	2.02	1.82
A-P3	5.02	6.00	0.30	1.81	Circular	15.00	RCP	0.012	5.82	167.53	167.40	2.21	10.41	6.35
A-P4	5.16	6.00	0.10	0.62	Circular	15.00	RCP	0.012	30.80	168.02	167.71	1.01	7.02	3.51
A-P5	6.52	5.69	0.67	3.83	Circular	15.00	RCP	0.012	53.52	167.41	166.70	1.33	8.06	3.12
A-P6	6.53	5.64	0.67	3.80	Circular	15.00	RCP	0.012	4.76	166.90	166.51	8.22	20.06	3.10
A-P7	6.85	5.64	0.86	4.85	Circular	18.00	RCP	0.012	121.39	166.41	165.00	1.16	12.26	6.52
A-P8	5.32	6.00	0.35	2.11	Circular	15.00	RCP	0.012	80.74	164.94	164.38	0.69	5.83	1.72
A-P9	7.09	5.54	1.30	7.21	Circular	18.00	RCP	0.012	106.51	164.28	162.75	1.43	13.63	4.08
A-P10	5.59	6.00	0.02	0.10	Circular	15.00	RCP	0.012	97.98	168.02	165.24	2.84	11.79	2.94
A-P11-O	7.33	EO_01 5.48	1.93	10.60	Circular	18.00	RCP	0.012	85.25	162.64	162.13	0.60	8.84	6.00
B-P1	0.00	0.00	0.00	8.90	Circular	24.00	RCP	0.012	27.05	167.90	167.80	0.37	14.90	4.95
B-P2	12.11	4.50	0.62	11.68	Circular	24.00	RCP	0.012	60.05	167.70	166.69	1.68	31.79	9.34
B-P3	0.00	0.00	0.00	0.33	Circular	15.00	RCP	0.012	19.15	170.35	169.28	5.59	16.54	5.29
B-P4	5.45	6.00	0.06	0.38	Circular	15.00	RCP	0.012	60.12	168.90	168.61	0.49	4.87	2.36
B-P5	5.76	5.91	0.14	1.16	Circular	15.00	RCP	0.012	77.95	168.20	167.40	1.02	7.08	4.25
B-P6	12.20	4.48	1.15	14.40	Circular	24.00	RCP	0.012	60.30	164.98	163.54	2.40	37.93	11.23
B-P7	12.54	4.46	1.15	14.38	Circular	24.00	RCP	0.012	200.70	163.34	159.66	1.83	33.19	10.17
B-P1-O	12.60	EO_02 4.39	1.15	14.30	Circular	24.00	RCP	0.012	43.95	159.46	158.24	2.78	40.84	11.85
C-P1-O	5.06	EO_05 6.00	0.07	0.43	Circular	15.00	RCP	0.012	20.27	171.87	170.29	7.82	19.57	6.42
D-P1-O	5.14	EO_06 6.00	0.19	1.16	Circular	15.00	RCP	0.012	73.84	187.67	181.22	8.77	20.72	9.10
E-P1-O	5.13	EO_07 6.00	0.33	2.00	Circular	15.00	RCP	0.012	77.02	180.40	174.68	7.45	19.10	10.07
F-P1-O	5.08	EO_08 6.00	0.38	2.28	Circular	15.00	RCP	0.012	39.66	170.70	168.99	4.32	14.54	8.60

Number of items reported: 23

Drainage Reports

Element Type: Area

Date: Thursday, September 18, 2014 11:09:43 AM

Drainage Data File: Proposed_Drainage

ID	AttachTo	Area (ac)	RunoffCoef	TimeofConc (min)	Intensity (in/h)	Peak (cfs)
A1	A-IN8	0.91	0.74	5.00	6.00	4.06
A2	A-IN6	0.37	0.52	5.00	6.00	1.16
A3	A-IN5	0.57	0.83	5.00	6.00	2.82
A4	A-IN3	0.10	0.72	5.00	6.00	0.44
A5	A-IN4	0.23	0.66	5.00	6.00	0.91
A6	A-IN2	0.38	0.70	5.00	6.00	1.60
A7	A-IN1	0.48	0.77	5.00	6.00	2.21
A8	A-IN7	0.02	0.81	5.00	6.00	0.07
A1a	PO_01 IN1a	1.88	0.49	13.00	4.30	3.96
A1b	EO_04 -	0.45	0.60	5.00	6.00	1.61
B1	B-IN3	3.24	0.39	12.00	4.50	5.69
B2	-	3.43	0.30	12.00	4.50	4.63
B3	B-IN4	0.43	0.89	5.00	6.00	2.27
B4	-	0.11	0.30	5.00	6.00	0.19
B5	B-IN2	0.10	0.89	5.00	6.00	0.56
B6	B-IN1	0.15	0.83	5.00	6.00	0.74
C1	C-IN1	0.21	0.90	5.00	6.00	1.13
D1	D-IN1	0.33	0.90	5.00	6.00	1.81
E1	E-IN1	0.42	0.90	5.00	6.00	2.25
F1	F-IN1	0.47	0.89	5.00	6.00	2.54

Number of items reported: 20

Drainage Reports

Element Type: Pipe

Date: Thursday, September 18, 2014 10:53:21 AM

Drainage Data File: Proposed_Drainage

Pipe ID	TC (min)	Intensity (in/h)	SumCA (ac)	TotalFlow (cfs)	Shape	Size (in)	Material	n	Pipe Length (ft)	InvertIn (ft)	InvertOut (ft)	Slope (%)	Capacity (cfs)	Velocity (ft/s)
A-P1	5.02	6.00	0.26	1.56	Circular	15.00	RCP	0.012	7.02	168.60	168.13	6.71	18.13	9.04
A-P2	6.39	6.00	0.26	1.56	Circular	15.00	RCP	0.012	144.54	167.63	167.51	0.08	2.02	1.81
A-P3	5.02	6.00	0.31	1.86	Circular	15.00	RCP	0.012	7.73	167.80	167.45	4.53	14.90	8.25
A-P4	5.22	6.00	0.07	0.41	Circular	15.00	RCP	0.012	37.65	168.40	168.00	1.06	7.21	3.17
A-P5	5.36	5.96	0.07	0.41	Circular	15.00	RCP	0.012	22.93	167.94	167.71	1.01	7.02	3.10
A-P6	6.54	5.68	0.64	3.63	Circular	15.00	RCP	0.012	53.51	167.41	166.70	1.33	8.06	2.96
A-P7	6.56	5.64	0.64	3.60	Circular	15.00	RCP	0.012	10.95	166.90	166.40	4.56	14.94	2.93
A-P8	6.87	5.63	0.84	4.72	Circular	18.00	RCP	0.012	116.12	166.30	165.00	1.12	12.04	6.40
A-P9	5.30	6.00	0.30	1.79	Circular	15.00	RCP	0.012	71.91	164.88	164.38	0.70	5.84	1.46
A-P10	7.11	5.54	1.28	7.12	Circular	18.00	RCP	0.012	107.22	164.28	162.73	1.44	13.67	4.03
A-P11	5.68	6.00	0.01	0.07	Circular	15.00	RCP	0.012	97.49	168.02	165.26	2.84	11.79	2.53
A-P12-O	7.34	EO_01 5.48	2.00	10.94	Circular	18.00	RCP	0.012	83.81	162.64	162.13	0.60	8.84	6.19
B-P1	0.00	0.00	0.00	8.90	Circular	24.00	RCP	0.012	13.90	167.90	167.79	0.76	21.38	6.49
B-P2	12.03	4.50	0.52	11.23	Circular	24.00	RCP	0.012	9.58	167.68	167.55	1.33	28.28	8.47
B-P3	12.15	4.49	0.52	11.23	Circular	24.00	RCP	0.012	59.72	167.50	166.71	1.33	28.28	8.48
B-P4	5.59	6.00	0.08	0.45	Circular	15.00	RCP	0.013	74.48	168.90	168.60	0.40	4.07	2.17
B-P5	0.00	0.00	0.00	0.33	Circular	15.00	RCP	0.012	18.15	170.35	169.34	5.59	16.54	5.29
B-P6	5.91	5.88	0.15	1.24	Circular	15.00	RCP	0.012	78.18	168.20	167.40	1.02	7.07	4.32
B-P7	12.25	4.47	1.07	14.00	Circular	24.00	RCP	0.012	60.04	164.99	163.54	2.42	38.16	11.20
B-P8	12.58	4.45	1.07	13.98	Circular	24.00	RCP	0.012	200.67	163.34	159.66	1.83	33.19	10.11
B-P1-O	12.65	EO_02 4.38	1.07	13.90	Circular	24.00	RCP	0.012	43.98	159.46	158.24	2.78	40.83	11.75
C-P1-O	5.05	EO_05 6.00	0.12	0.72	Circular	15.00	RCP	0.013	20.27	171.87	170.29	7.82	18.06	7.15
D-P1-O	5.12	EO_06 6.00	0.22	1.29	Circular	15.00	RCP	0.012	67.78	187.10	181.22	8.70	20.65	9.37
E-P1-O	5.12	EO_07 6.00	0.30	1.77	Circular	15.00	RCP	0.012	68.03	179.89	174.68	7.68	19.40	9.81
F-P1-O	5.06	EO_08 6.00	0.34	2.04	Circular	15.00	RCP	0.012	31.11	170.39	168.99	4.51	14.85	8.46

Number of items reported: 25

DATE PREPARED

3/7/13

DATE CHECKED

PREPARED BY

PWY

CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

SHEET NO.

1

SUBJECT:

PROPOSED TRENCH: PO_01

DIMENSIONS: 5'(W) X 100'(L) X 5'(D) SEE DIAGRAM ON SHEET 3

INFILTRATION A = 500 SF.

$$V = 2500 \text{ ft}^3$$

$$\begin{aligned} \text{void ratio} & \rightarrow 3'' \text{ stone} \\ V_{\text{STORAGE}} &= V \cdot e \\ &= 2500 \text{ ft}^3 (0.4) \\ &= 1000 \text{ ft}^3 \end{aligned}$$

ASSUME: $T_c = 13$ mins post-installation

$$V_{\text{stor}} = \frac{1}{2} Q_{10\text{yr}} (19.5\text{m}) (60 \frac{\text{s}}{\text{min}})$$

$$Q_{10\text{yr}} = \frac{V_s(2)}{(19.5\text{m}) (60 \frac{\text{s}}{\text{min}})}$$

$$= (1000 \text{ ft}^3)(2) / (19.5\text{m}) (60 \frac{\text{s}}{\text{min}})$$

BACK CALCULATING

$$Q_{10\text{yr}} = 1.7 \text{ cfs}$$

THIS FLOW IS INFILTRATED INTO THE TRENCH

MEANING THIS FLOW IS NOT AVAILABLE FOR INFILTRATION

HENCE THE INFILTRATION RATE IS REDUCED

$$Q_{\text{NET}} = 4.0 \text{ cfs} - 1.7 \text{ cfs}$$

$$= 2.3 \text{ cfs} \leftarrow \text{NEW FLOW}$$

$$2.3 \text{ cfs} \ll 2.6 \text{ cfs}$$

$$Q_{\text{NET}} \ll \text{EXISTING } Q_{10}$$

IMPROVING THE OVERALL WATER QUALITY BY
REDUCING ROADWAY RUNOFF WHILE STILL
MEETING H&D REQUIREMENTS.

DATE PREPARED

3/17/13

DATE CHECKED

PREPARED BY

PWY

CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

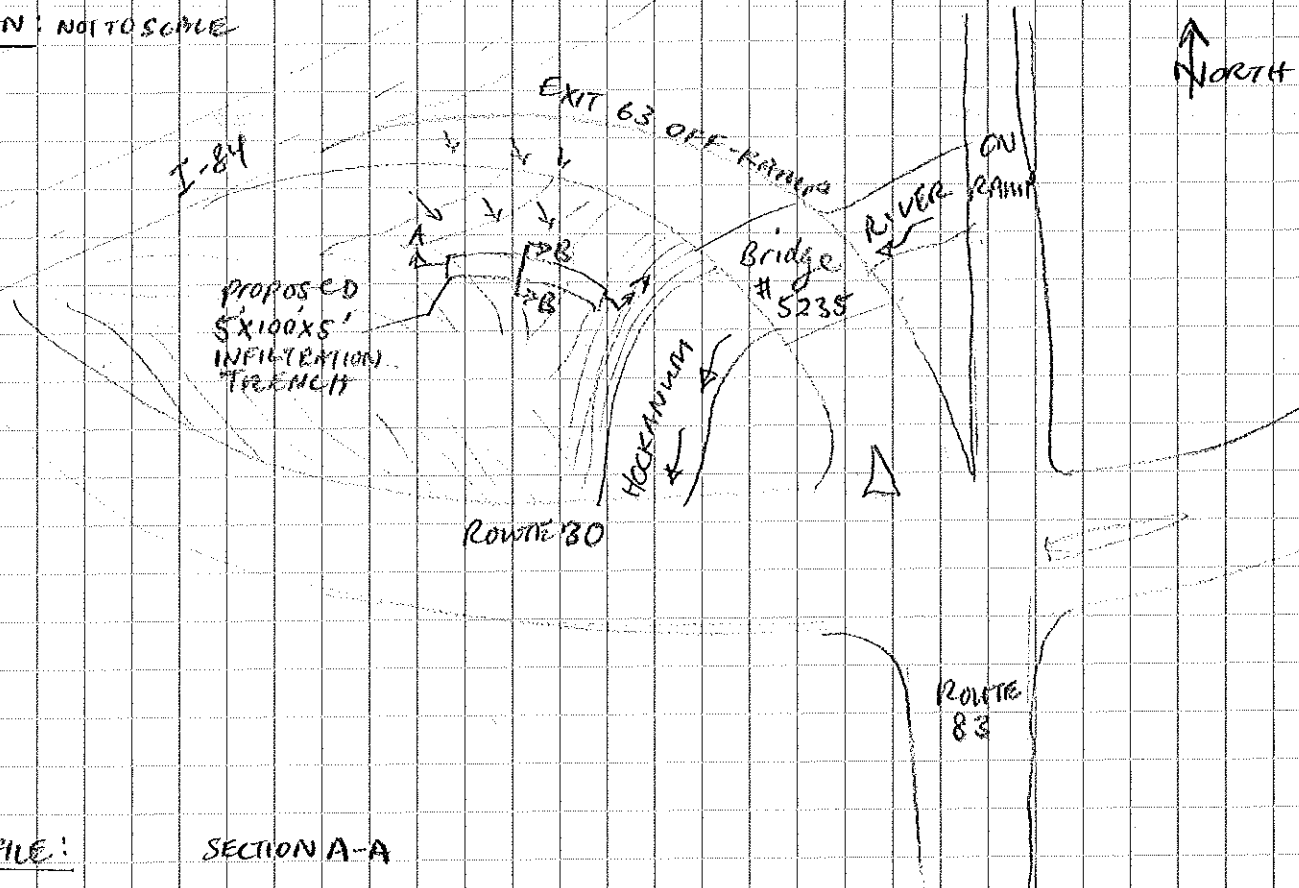
WORK ORDER NO.

76-192

SHEET NO. 2

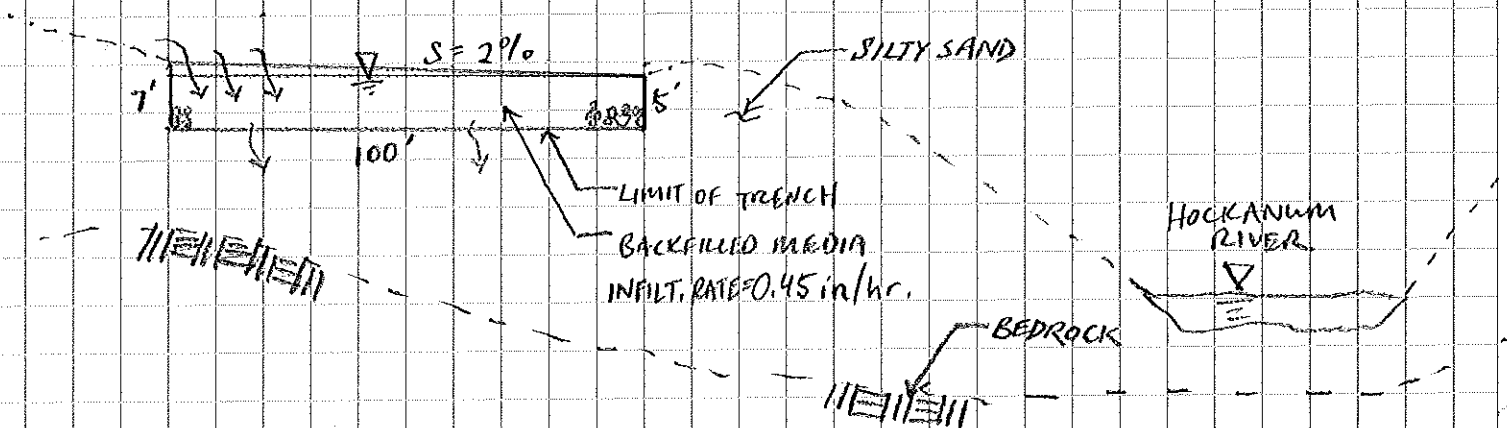
SUBJECT:

PLAN: NOT TO SCALE



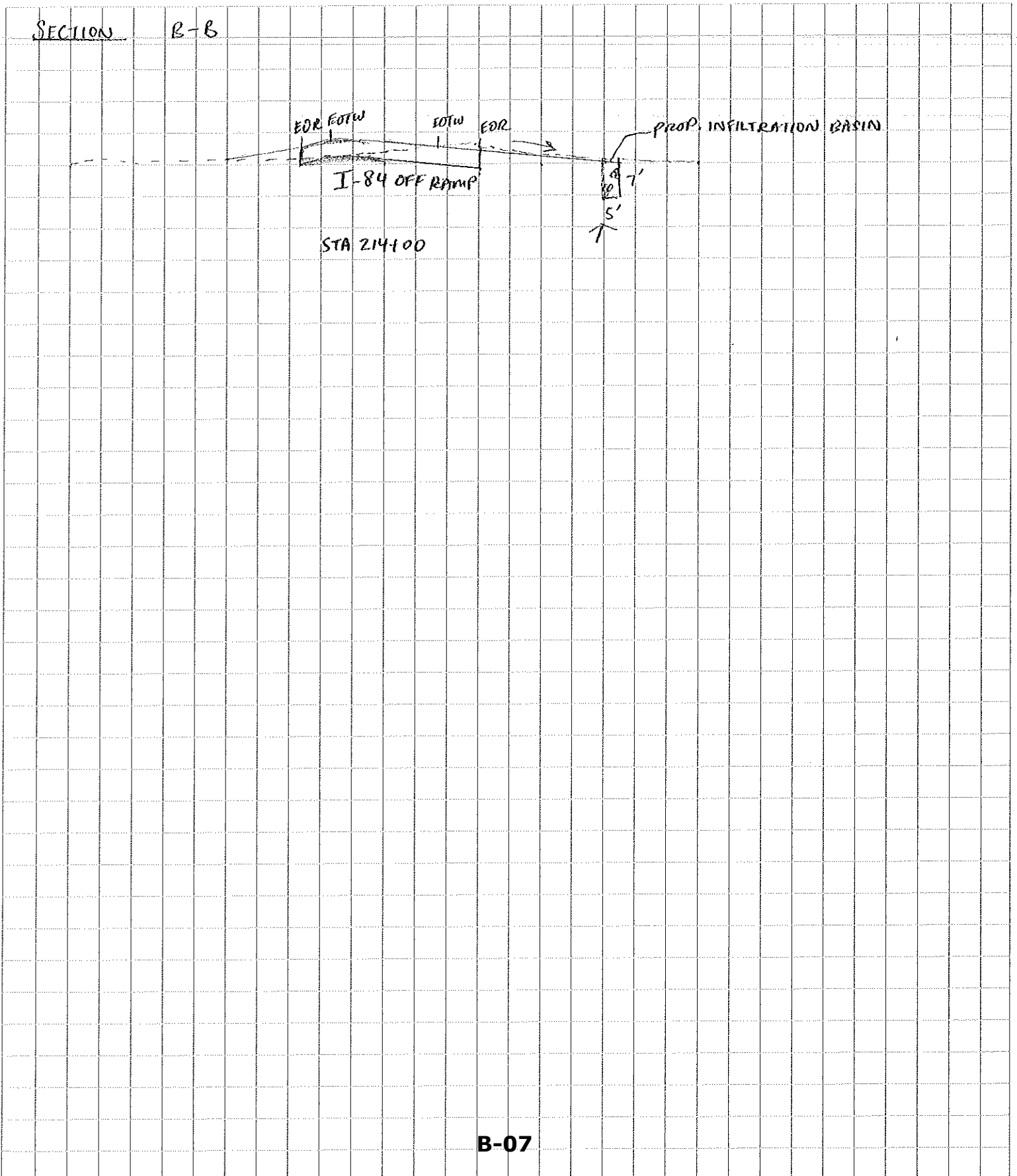
PROFILE:

SECTION A-A



DATE PREPARED 3/17/13	PREPARED BY Pwy	State of Connecticut Department of Transportation Bureau of Engineering & Highway Operations DES-003 REV 1-93 (302-06-0225) COMPUTATION SHEET	ORGANIZATION UNIT NO. 1310	WORK ORDER NO. 76-193
DATE CHECKED	CHECKED BY			SHEET NO. 3

SUBJECT:



B-07

DATE PREPARED
3/17/13
DATE CHECKED

PREPARED BY
PWY
CHECKED BY

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

SHEET NO.

4

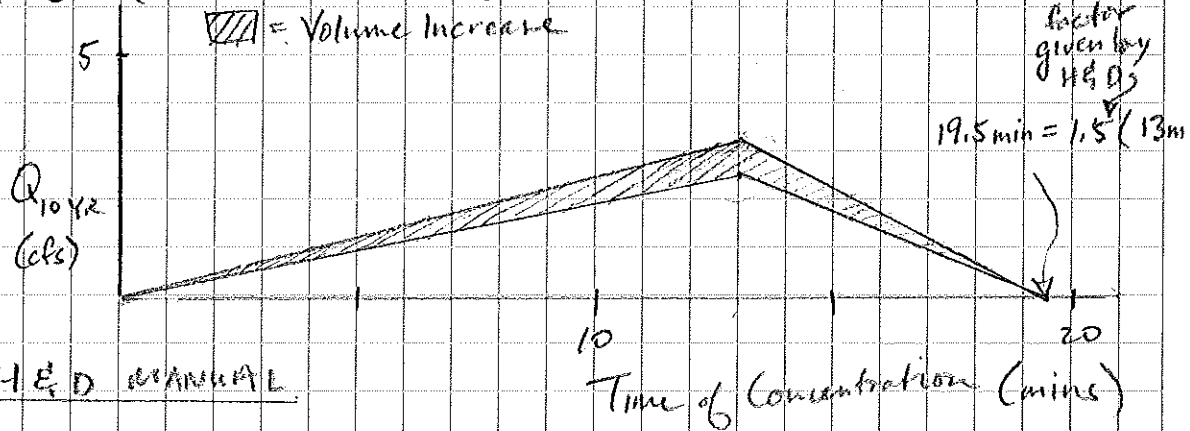
SUBJECT:

DETERMINING STORAGE VOLUME:

$$Q_{10 \text{ yr EXIST}} = 2.6 \text{ cfs (FROM DRAINAGE COMPS)}$$

$$Q_{10 \text{ yr PROP}} = 4.0 \text{ cfs (FROM DRAINAGE COMPS)}$$

$$T_c = 13 \text{ mins}$$



METHOD 1: H&D MANUAL

$$\begin{aligned} \text{Volume Increase} &= \left[\frac{1}{2} (4.0 \text{ cfs}) (19.5 \text{ min}) \left(60 \frac{\text{s}}{\text{min}} \right) \right] - \left[\frac{1}{2} (2.6 \text{ cfs}) (13 \text{ min}) \left(60 \frac{\text{s}}{\text{min}} \right) \right] \\ &= 2340 \text{ ft}^3 - 1521 \text{ ft}^3 \\ &= 819 \text{ ft}^3 \end{aligned}$$

METHOD 2: STORAGE QUALITY MANUAL

$$\text{WATER QUALITY VOLUME (WQV)} = (1") (R) (A) / 12$$

$$R = 0.05 + 0.009 I$$

$$= 0.05 + 0.009 \left(\frac{0.6 \text{ Acres}}{1.8 \text{ Acres}} \times 100 \right)$$

Impervious Area
total area

$$= 0.35$$

$$\text{WQV} = 1" (0.35) (1.8 \text{ Acres}) / 12$$

$$= 0.053 \text{ Acre} \cdot \text{ft}$$

$$= 2287 \text{ ft}^3$$

DATE PREPARED

9/17/13

PREPARED BY

CZ

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

DATE CHECKED

CHECKED BY

SHEET NO. 5

SUBJECT:

WQF (Appendix B CT Stormwater Quality Manual):

$$WQV = 2287 \text{ ft}^3 = .053 \text{ acre-foot} \rightarrow \text{from previous calculations}$$

$$CN = \frac{1000}{(10 + 5P + 10Q - 10(Q^2 + 1.25QP)^{.5})}$$

CN = runoff curve number

P = design precipitation (inches) = 1 inch

Q = runoff depth (watershed inches)

$$\rightarrow \frac{WQV (\text{ac-ft}) \times 12 (\text{in/ft})}{\text{drainage area (acres)}} = \frac{.053 \times 12}{1.8} \Rightarrow Q = .353 \text{ in.}$$

$$CN = \frac{1000}{(10 + 5 \cdot 1 + 10 \cdot .353 - 10(.353^2 + 1.25 \cdot .353 \cdot 1)^{.5})} = \frac{1000}{18.53 - 10(.7522)} \Rightarrow CN = 90.85 \rightarrow \text{use } 91$$

$$T_c = 13 \text{ min}$$

\rightarrow from previous calcs per H&D

$$I_a = .198 \text{ in}$$

\rightarrow per Table 4-1: Appendix B

$$q_v = 520 \text{ csm/in}$$

\rightarrow Exhibit 4-III

$$WQF = q_v \cdot A \cdot Q$$

$$WQF = 520 \text{ csm/in} \times .0028 \text{ mi}^2 \times .353 \text{ in} \Rightarrow WQF = .514 \text{ cfs}$$

DATE PREPARED

10/1/13

PREPARED BY

CZ

State of Connecticut
Department of Transportation
Bureau of Engineering & Highway Operations
DES-003 REV 1-93
(302-06-0225)
COMPUTATION SHEET

ORGANIZATION UNIT NO.

1310

WORK ORDER NO.

76-193

DATE CHECKED

CHECKED BY

SHEET NO.

1

SUBJECT:

WQV Calculations Sedimentation Basin (Drainage area A):

Weighted 'I':

$$A3 - I = .74 \times 39,768 \text{ sf} = 29,428 \text{ sf}$$

$$A4 - I = .39 \times 16,130 = 6,291 \text{ sf}$$

$$A5 - I = .88 \times 24,183 = 21,281 \text{ sf}$$

$$A10 - I = .59 \times 7,795 = 4,599 \text{ sf}$$

$$A11 - I = .71 \times 6,858 = 4,869 \text{ sf}$$

$$A12 - I = .65 \times 16,658 = 10,828 \text{ sf}$$

$$A13 - I = .67 \times 20,824 = 13,952 \text{ sf}$$

$$\text{Total impervious area } A = 91,248 \text{ sf}$$

$$\text{Total area } A = 132,216 \text{ sf}$$

$$\text{Area } A \text{ 'I' value} = .69$$

WQV:

$$WQV = \frac{1'' \cdot R \cdot A}{12}$$

$$R = .05 + .009(I) \Rightarrow .05 + .009(.69) \rightarrow R = .671$$

$$A = 132,216 \text{ sf} / 43,560 \frac{\text{sf}}{\text{ac}} = 3.04 \text{ acres}$$

$$WQV = \frac{1'' \cdot .671 \cdot 3.04}{12} \rightarrow WQV = .167 \text{ ac-ft} \times 43,560 \text{ ft}^2/\text{ac} = 7,275 \text{ ft}^3$$

B-10

PROJECT DESCRIPTION:						DEPARTMENT OF TRANSPORTATION								By:		
						OFFICE OF ENGINEERING						DATE:	PROJECT NO.	CZ		
TOWN:												10/01/13	76-193			
MANCHESTER												UNIT:	SHEET NO.	checked:		
												1310				
SEDIMENTATION BASIN VOLUME COMPS																
ELEV. 162.14																
STATION	END AREA	DOUBLE END AREA	CUBIC FEET	CUBIC YARDS	END AREA	DOUBLE END AREA	CUBIC FEET	CUBIC YARDS	END AREA	DOUBLE END AREA	CUBIC FEET	CUBIC YARDS	END AREA	DOUBLE END AREA	CUBIC FEET	CUBIC YARDS
(100'-00 = 10000)																
2085	0	---	---	---	0	---	---	---	0	---	---	---	0	---	---	---
2090	5 60.19	30	150	6	0											
2100	10 61.18	61	607	22	0											
2110	10 61.18	61	612	23	0											
2120	10 61.18	61	612	23	0											
2130	10 1.74	31	315	12	0											
2136	6 1.74	2	10	0	0											
	0	1			0											
	0				0											
	0				0											
	0				0											
	0				0											
	0				0											
	0				0											
	0				0											
	0				0											
B TOTALS			2,305	86								0				0

NOTES:

All modified riprap disturbed along the stream shall be replaced to match proposed grade according to the final grading plans.

BEGIN STATE PROJECT NO. 76-193
I-84 EXIT 63 OFF-RAMP
STATION 211+00

R-B END ANCHORAGE (TYPE I - 10GA)
REMOVE METAL BEAM RAIL
AND PAVEMENT

R-B END ANCHORAGE (TYPE I - 10GA)
216'- METAL BEAM RAIL (RB-350 10GA)
TURF ESTABLISHMENT

SEDIMENTATION CONTROL
SYSTEM (TYP.)
50'- PAVEMENT FOR RAILING
R-B 350 BRIDGE ATTACHMENT-SAFETY SHAPE PARAPET 10GA
GRANITE STONE TRANSITION CURBING

BRIDGE RECONSTRUCTION
(SEE STRUCTURE PLANS)
REPLACE ALL DISTURBED MODIFIED RIPRAP ALONG BOTH STREAMBANKS
R-B 350 BRIDGE ATTACHMENT TRAILING END 10GA.
184'- METAL BEAM RAIL (R-B 350 10GA)
118'- BCLC
117'- BCLC

FEMA 100 YR FLOODPLAIN
& FLOODWAY LIMITS
R-B 350 BRIDGE ATTACHMENT
SAFETY SHAPE PARAPET 10GA.
LIMIT OF MILLING AND OVERLAY

LIMIT OF CONSTRUCTION
I-84 EXIT 63 ON-RAMP
STATION 303+65

CUT BIT. CONC. PAVEMENT
RESET GRANITE STONE TRANSITION CURBING
REMOVE METAL BEAM RAIL AND PAVEMENT
50'- PAVEMENT FOR RAILING
230'- METAL BEAM RAIL (R-B 350 10GA)
85'- METAL BEAM RAIL (R-B 350 10GA)
R-B END ANCHORAGE (TYPE I - 10GA)
TURF ESTABLISHMENT
REMOVE METAL BEAM RAIL AND PAVEMENT
ATTACH R-B 350 TO IMPACT ATTENUATOR
TYPE B IMPACT ATTENUATION SYSTEM
(NON-GATING)
METER TO BE RELOCATED BY OTHERS
205'- BCLC
SODDING
HYDRANT TO BE RELOCATED BY OTHERS
CUT BIT. CONC. PAVEMENT

MATCH TO CONSTRUCTION PLAN NO. 2

MATCH TO CONSTRUCTION PLAN NO. 3

BEGIN STATE PROJECT NO. 76-193
FEDERAL AID PROJECT NO. 0844(147)
ROUTE 30 STATION 103+40

RIGHTS OF WAY LEGEND

- B** EASEMENT TO SLOPE FOR THE SUPPORT OF THE HIGHWAY ACQUIRED
- E** DRAINAGE RIGHT OF WAY ACQUIRED
- L** CONSTRUCTION EASEMENT ACQUIRED
- ROW ACQUISITION LINE

END GRANITE STONE CURBING
LIMIT OF MILLING
AND OVERLAY

R-B END ANCHORAGE (TYPE I)
65'- METAL BEAM RAIL (R-B 350)
50'- PAVEMENT FOR RAILING
METAL BEAM RAIL (R-B 350 SYSTEM 5A)
R-B 350 BRIDGE ATTACHMENT-VERTICAL SHAPE PARAPET

LIMITS OF CROSS
SLOPE CORRECTION
(WEDGE COURSE)

124'- GRANITE STONE CURBING
R-B 350 BRIDGE ATTACHMENT TRAILING END
METAL BEAM RAIL (R-B 350 SYSTEM 5A)
CUT BIT. CONC. PAVEMENT
50'- PAVEMENT FOR RAILING
120'- METAL BEAM RAIL (R-B 350)
83'- CURVED GRANITE STONE CURBING
METAL BEAM RAIL (R-B 350 SYSTEM 5)
CONCRETE SIDEWALK RAMP (TYPE 1a)
187'- GRANITE STONE CURBING
METAL BEAM RAIL (R-B 350 SYSTEM 5)
TEXTURED CONCRETE MEDIAN


TEXTURED CONC.
MEDIAN
CUT BIT. CONC. PAVEMENT
185'- GRANITE STONE CURBING
SODDING
160'- BCLC
R=47'
50'- CURVED GRANITE STONE CURBING
CONC. SIDEWALK (MATCH INTO EXISTING)
CONCRETE SIDEWALK RAMP (TYPE 1a)
RESET GRANITE STONE CURBING
CUT BIT. CONC. PAVEMENT

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.


Plotted Date: 6/26/2015

DESIGNER/DRAFTER: RB	CHECKED BY: JA
SCALE IN FEET 0 40 80 SCALE 1"=40'	



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\\VHW_MSH_0076_0193_PLN_01.dgn



SIGNATURE/
BLOCK:
OFFICE OF ENGINEERING

APPROVED BY:
Will B. Smith

PROJECT TITLE:
**IMPROVEMENTS ON I-84 EXIT 63
OFF-RAMP AND INTERSECTION
OF ROUTES 30 & 83**

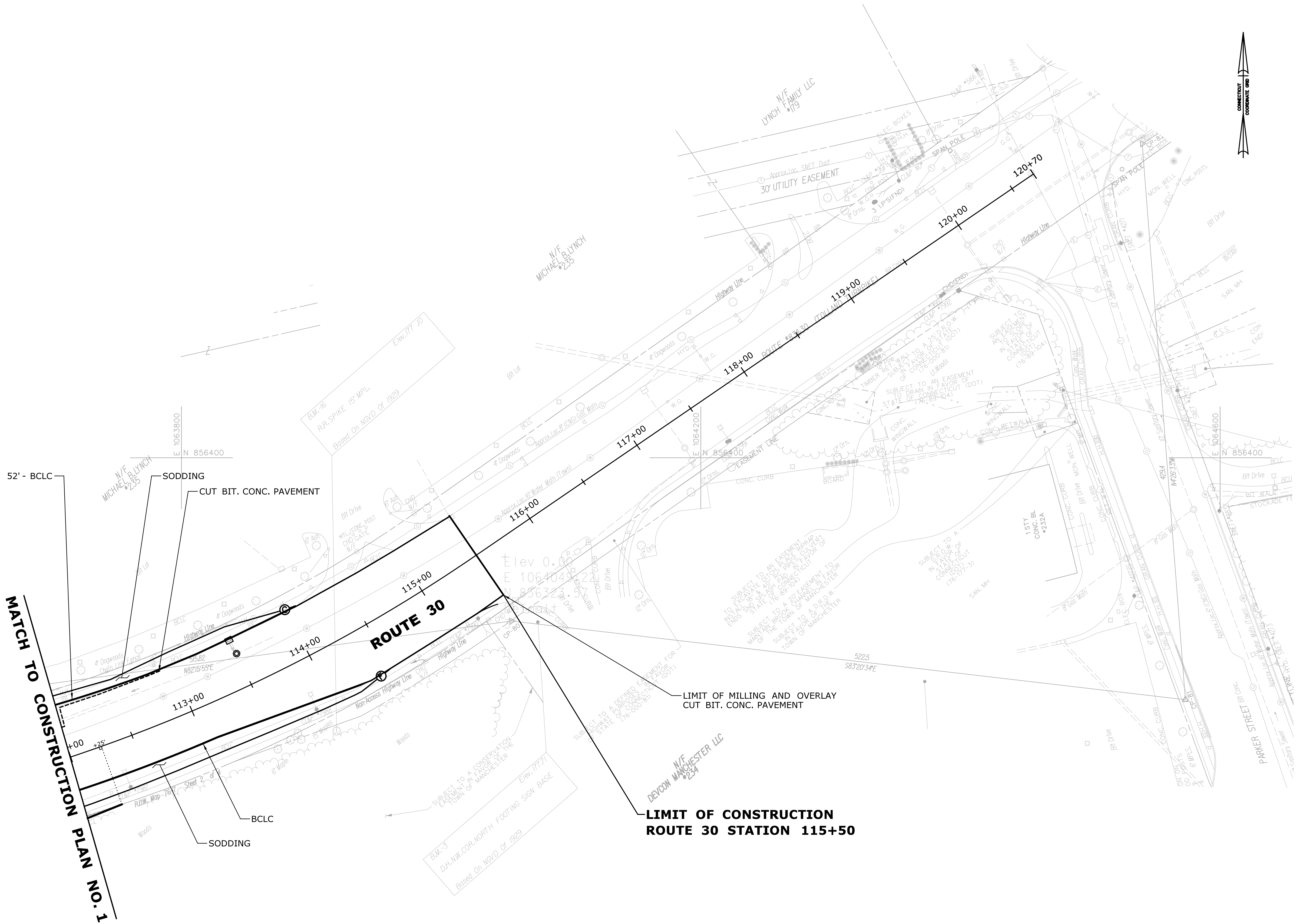
TOWN:
MANCHESTER


DRAWING TITLE:
**CONSTRUCTION
PLAN SHEET 1**

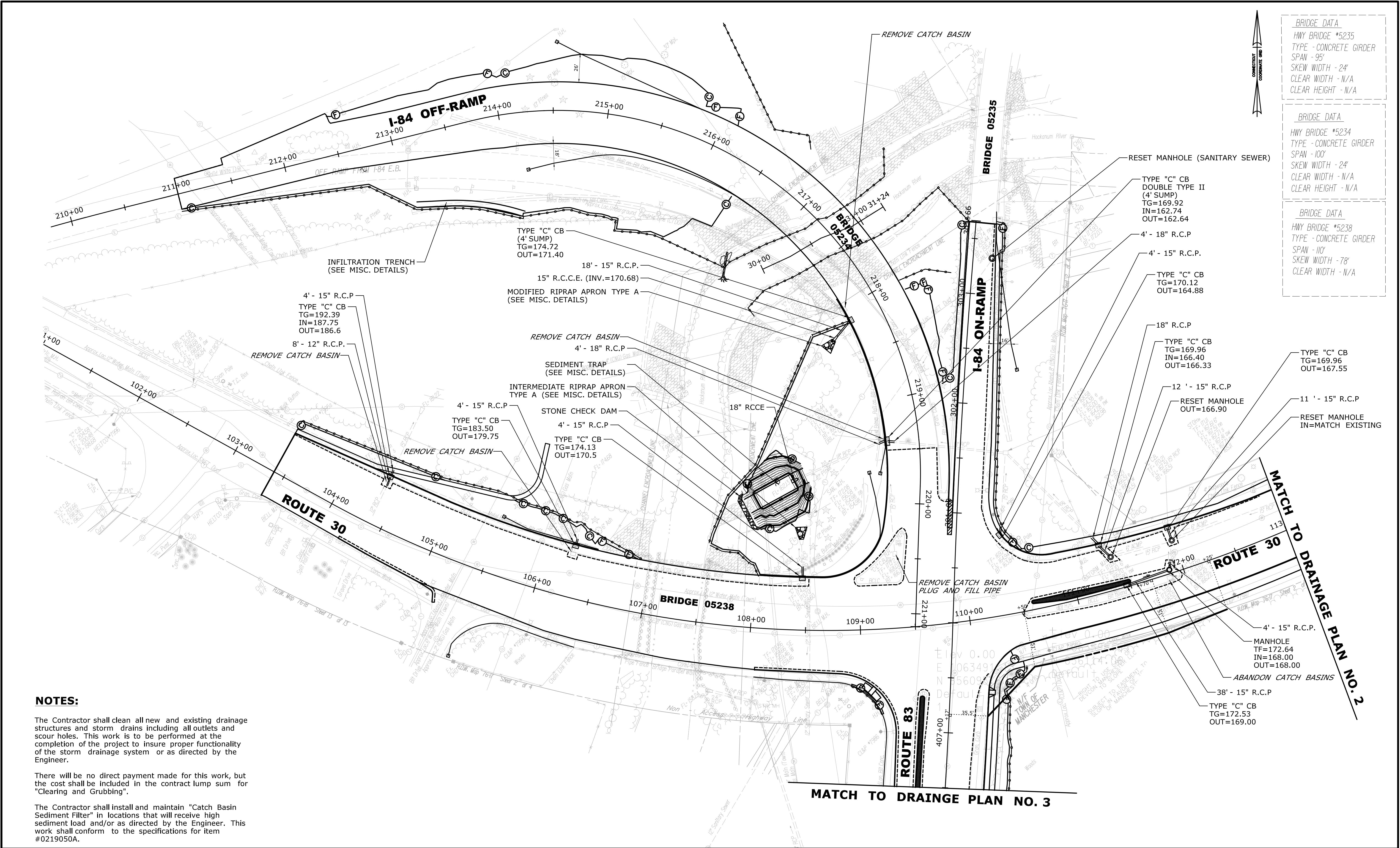
PROJECT NO.
76-193





DRAWING NO.
PLN-01

SHEET NO.



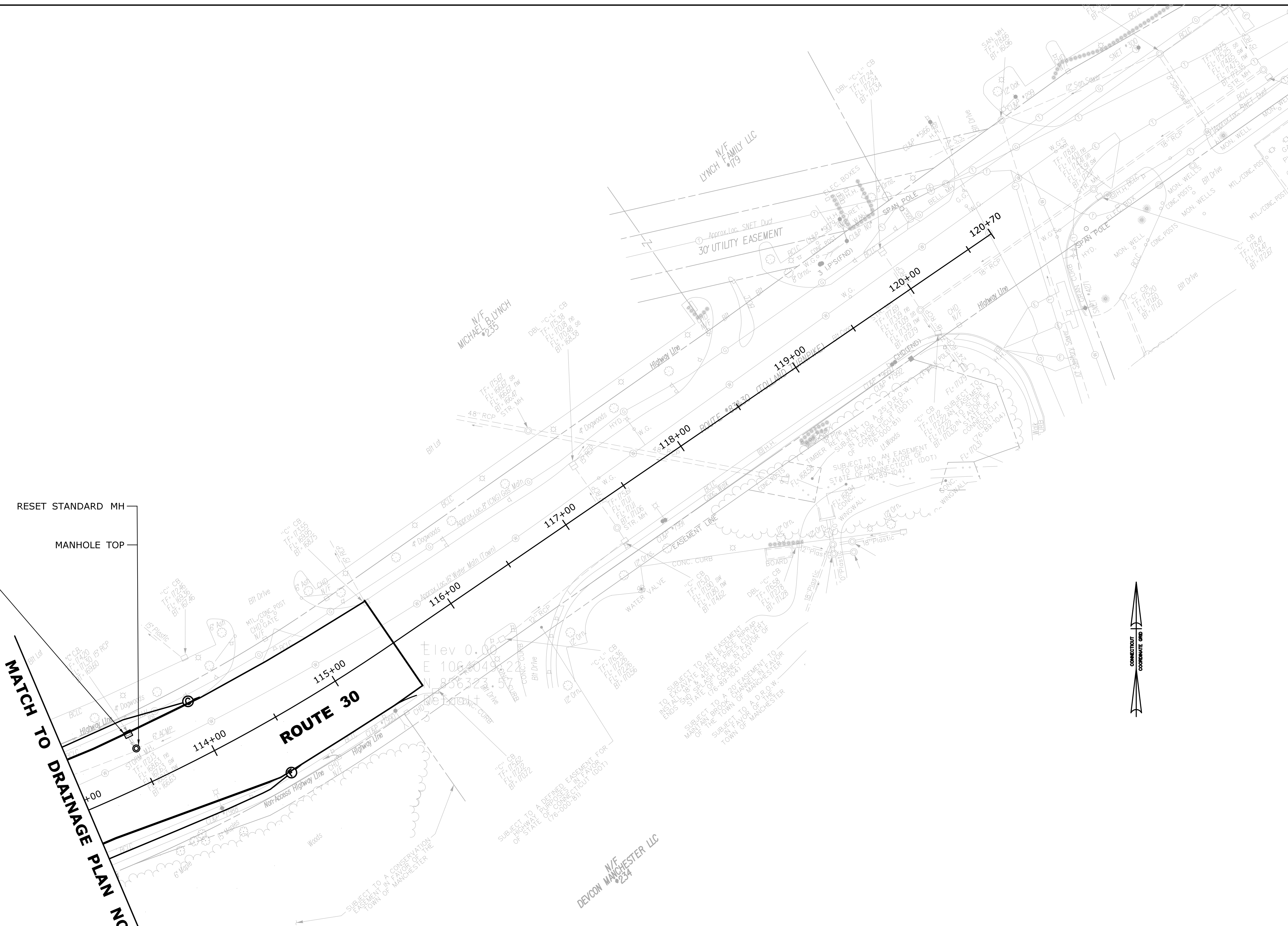
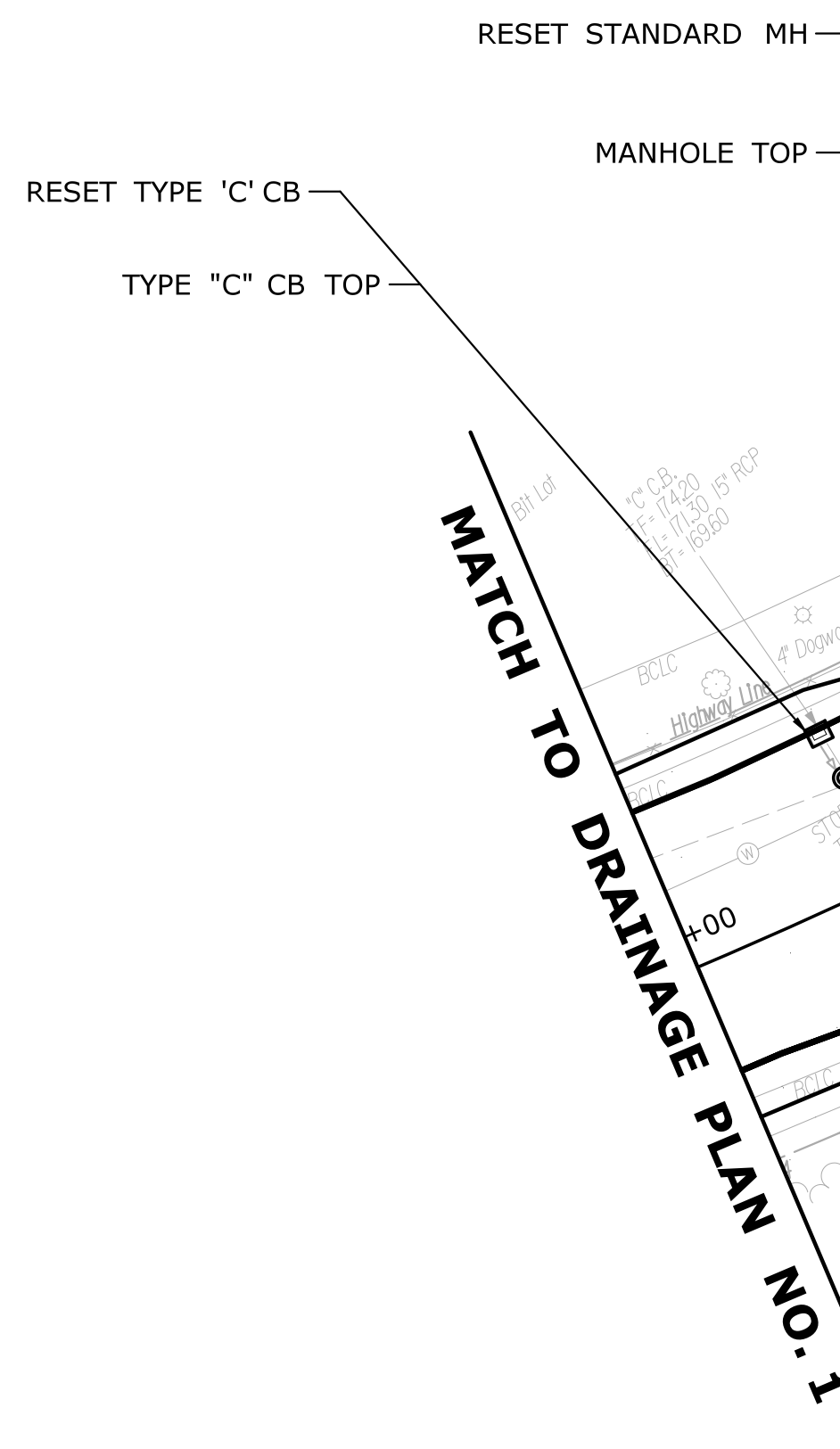
-	-	-	-	THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.	DESIGNER/DRAFTER: RB CHECKED BY: JA SCALE IN FEET 0 40 80 SCALE 1"=40'	 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: ...\\HW_MSH_0076_0193_PLN_02.dgn	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: <i>Will B. Smith</i>	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: MANCHESTER DRAWING TITLE: CONSTRUCTION PLAN SHEET 2	PROJECT NO. 76-193 DRAWING NO. PLN-02 SHEET NO.
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 6/26/2015						



					DESIGNER/DRAFTER: RB		 STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	 OFFICE OF ENGINEERING	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER	PROJECT NO. 76-193		
					CHECKED BY: JA							DRAWING NO. DRG-01	
					SCALE IN FEET  SCALE 1"=40'								SHEET NO.
					APPROVED BY: 								
					FILENAME: ...\\VHW_MSH_0076_0193_DRG_01.dgn								
REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 6/26/2015									

The Contractor shall clean all new and existing drainage structures and storm drains including all outlets and scour holes. This work is to be performed at the completion of the project to insure proper functionality of the storm drainage system or as directed by the Engineer.

The Contractor shall install and maintain "Catch Basin Sediment Filter" in locations that will receive high sediment load and/or as directed by the Engineer. This work shall conform to the specifications for item #0219050A.

[illegible]

BEGIN STATE PROJECT NO. 76-193
FEDERAL AID PROJECT NO. 0844(147)
I-84 EXIT 63 OFF-RAMP
STATION 211+00

BEGIN STATE PROJECT NO. 76-193
FEDERAL AID PROJECT NO. 0844(147)
ROUTE 30 STATION 103+40

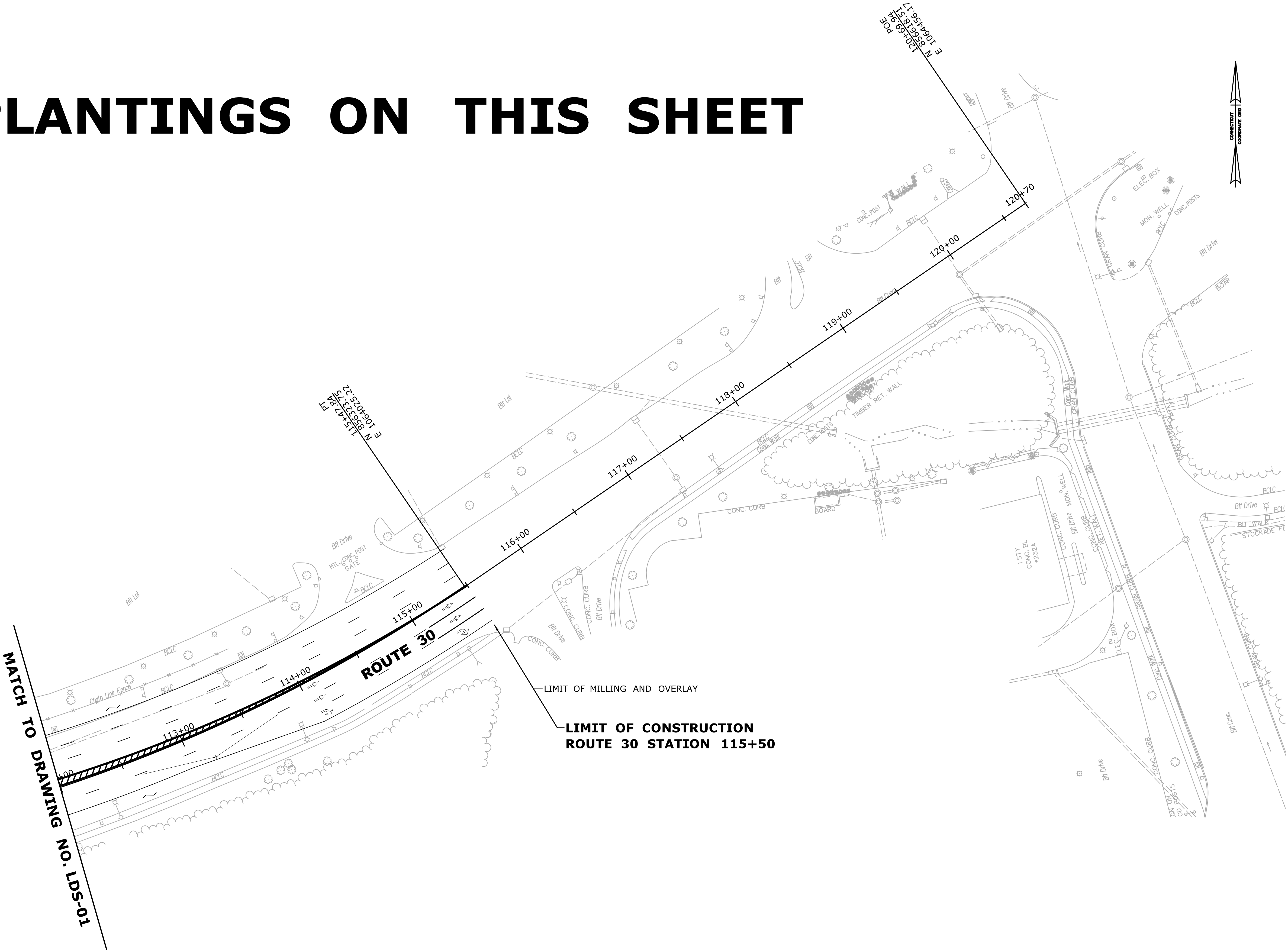
PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	SIZE	QTY.	SPACING	COMMENTS
A.r.	Acer rubrum	Red Maple	3'-4' Ht. B.B.Whips	160	5' On Center	Spring Only
*A.r.	Acer rubrum	Red Maple	2"-2 1/2" Cal.B.B.	3	Field Located	Spring Only
B.n.	Betula nigra	River Birch	8'-10' Ht. B.B.	6	Field Located	Spring Only
Cr.l.	Crataegus viridis 'Winter King'	Green Hawthorn	2"-2 1/2" Cal. B.B.	6	Field Located	Spring Only
P.s.	Pinus strobus	White Pine	5'-6' Ht. B.B.	5	Field Located	
Pic.a.	Picea abies	Norway Spruce	5'-6' Ht. B.B.	17	Field Located	Spring Only
Pl.a.	Platanus acerifolia	London Planetree	2"-2 1/2" Cal.B.B.	7	Field Located	Spring Only
Q.p.	Quercus palustris	Pin Oak	24"-36" Ht. B.B.	160	Field Located	
*Q.p.	Quercus palustris	Pin Oak	2"-2 1/2" Cal.B.B.	5	Field Located	
Q.r.	Quercus rubra	Northern Red Oak	24"-36" Ht. B.B.	160	5' On Center	Spring Only
*Q.r.	Quercus rubra	Northern Red Oak	2 1/2"- 3" Cal. B.B.	2	Field Located	Spring Only
V.d.	Viburnum dentatum	Arrowwood Viburnum	18"-24" Ht. B.B.	70	3' On Center	Spring Only
J.c.PC.	Juniperus chinensis 'Pfitzeriana compacta'	Compact Pfitzer Juniper	18"-24" Ht. B.B.	10	3' On Center	
Hem.HR	Hemerocallis Happy Return	Happy Return Daylily	1 Gallon Container	125	1.5' On Center	
				TOTAL = 650 S.Y.		
				Wood Chip Mulch		
				Root Pruning		
				Special Soil Preparation		

Note:
1. * Denotes different sizes of the same plant.
2. "Spring Only" - denotes plants to be dug in the Spring.
3. Wood Chip Mulch - Install all shrubs in beds of wood chips.

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: 6/15/2015	DESIGNER/DRAFTER: D.BARNES CHECKED BY: M.C. SCALE IN FEET 0 40 80 SCALE 1"=40'	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: ...VHW_MSH_0076_0193_LDS-02.dgn	SIGNATURE/ BLOCK: OFFICE OF ENGINEERING APPROVED BY: <i>Walter Bortol</i>	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION OF ROUTES 30 & 83	TOWN: TOWN OF MANCHESTER DRAWING TITLE: LANDSCAPE DESIGN PLAN	PROJECT NO. 76-193 DRAWING NO. LDS-02 SHEET NO.
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NO PLANTINGS ON THIS SHEET



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-	-	-	-
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-	-	-	-
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REV.	DATE	REVISION DESCRIPTION	SHEET NO.

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 5/29/2015

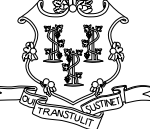
DESIGNER/DRAFTER:
D.BARNES

CHECKED BY:
M.C.

SCALE IN FEET

0 40 80

SCALE 1"=40'

 **STATE OF CONNECTICUT**
DEPARTMENT OF TRANSPORTATION

Filename: ...\\HW..MSH..0076..0193..LDS-03.dgn

SIGNATURE/
BLOCK:

OFFICE OF ENGINEERING

APPROVED BY:

Will B. Hall

PROJECT TITLE:

**IMPROVEMENTS ON I-84 EXIT 63
OFF-RAMP AND INTERSECTION
OF ROUTES 30 & 83**

TOWN:

MANCHESTER

DRAWING TITLE:

**LANDSCAPE DESIGN
PLAN**

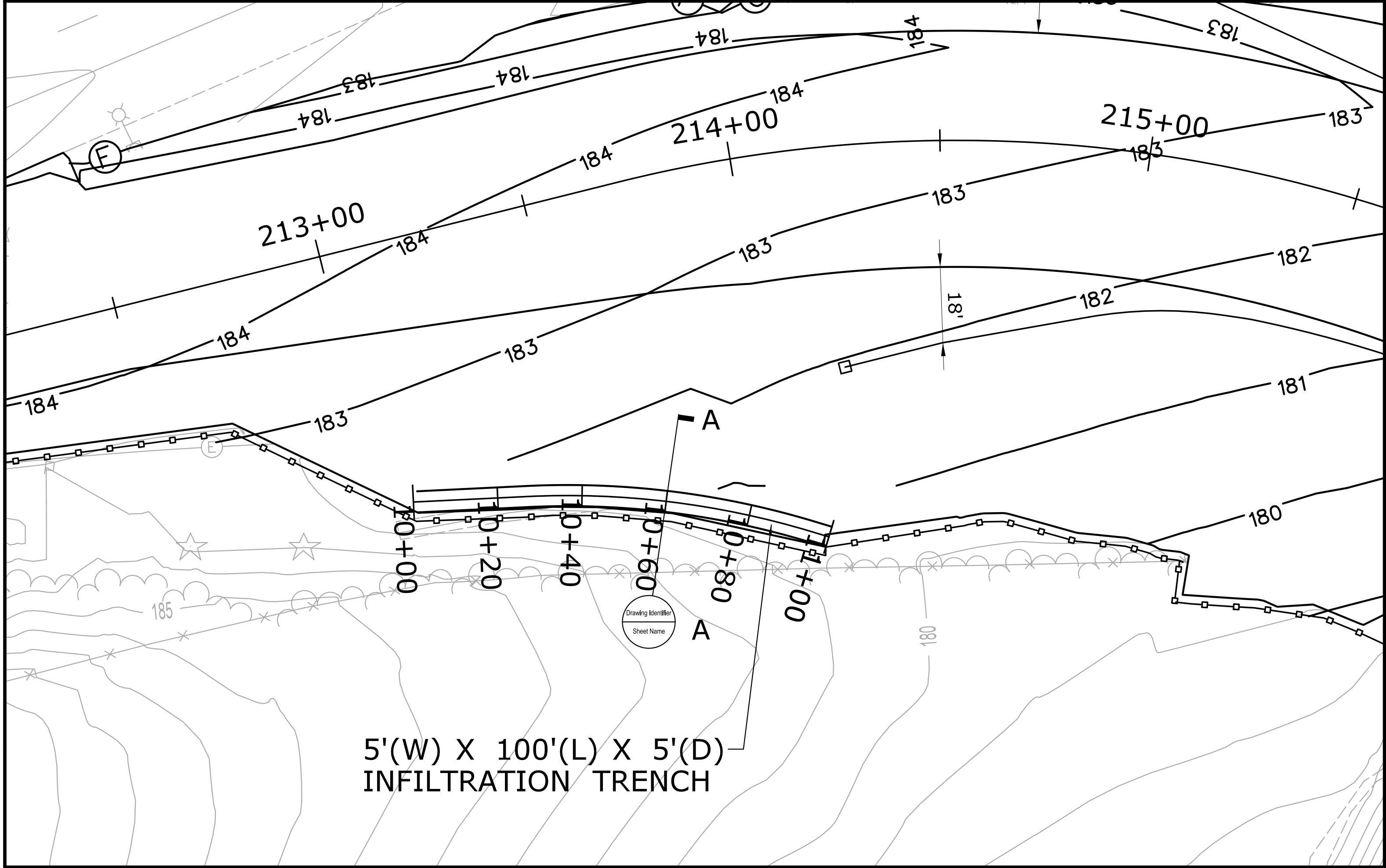
PROJECT NO.

76-193

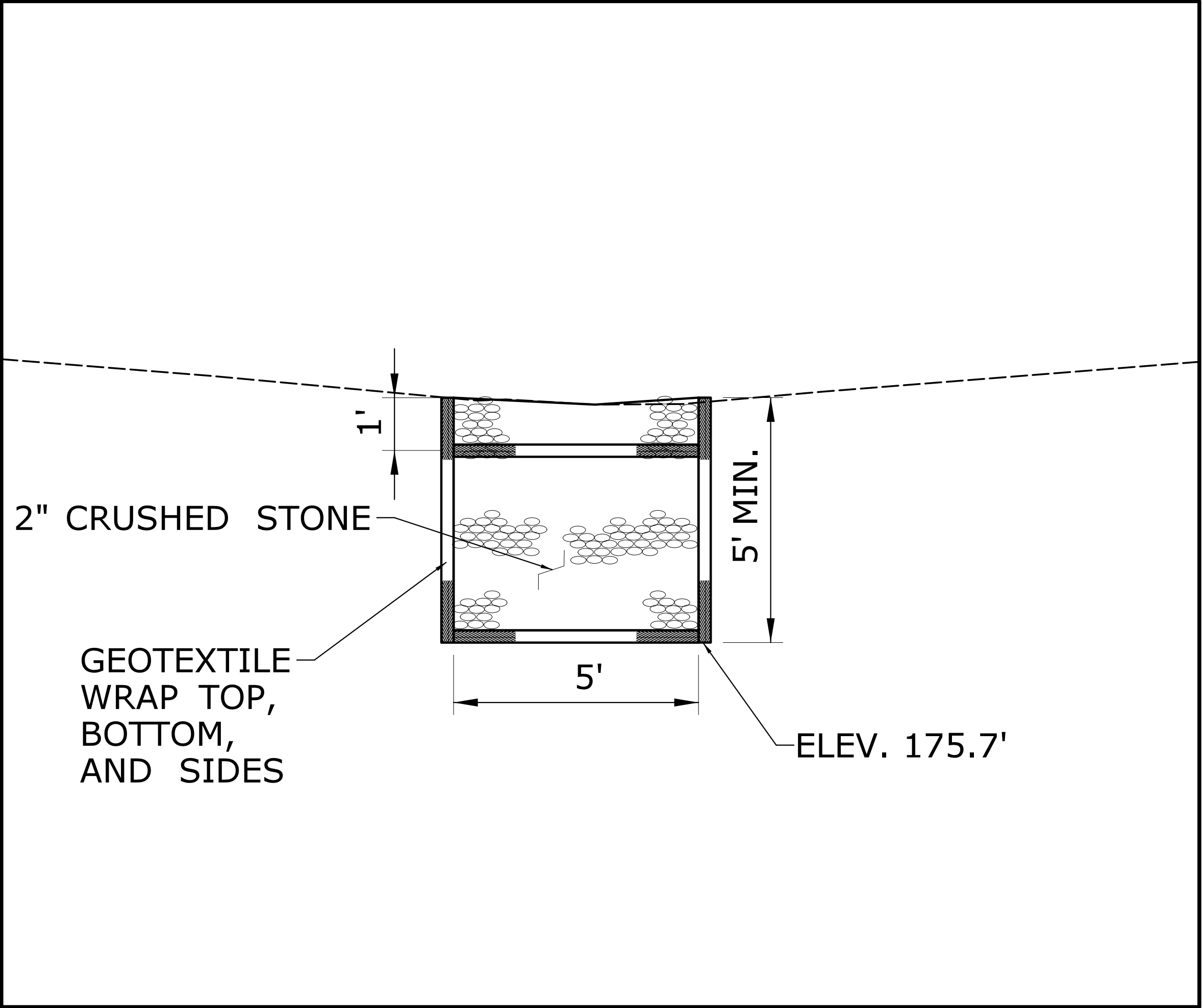
DRAWING NO.

LDS-03

SHEET NO.

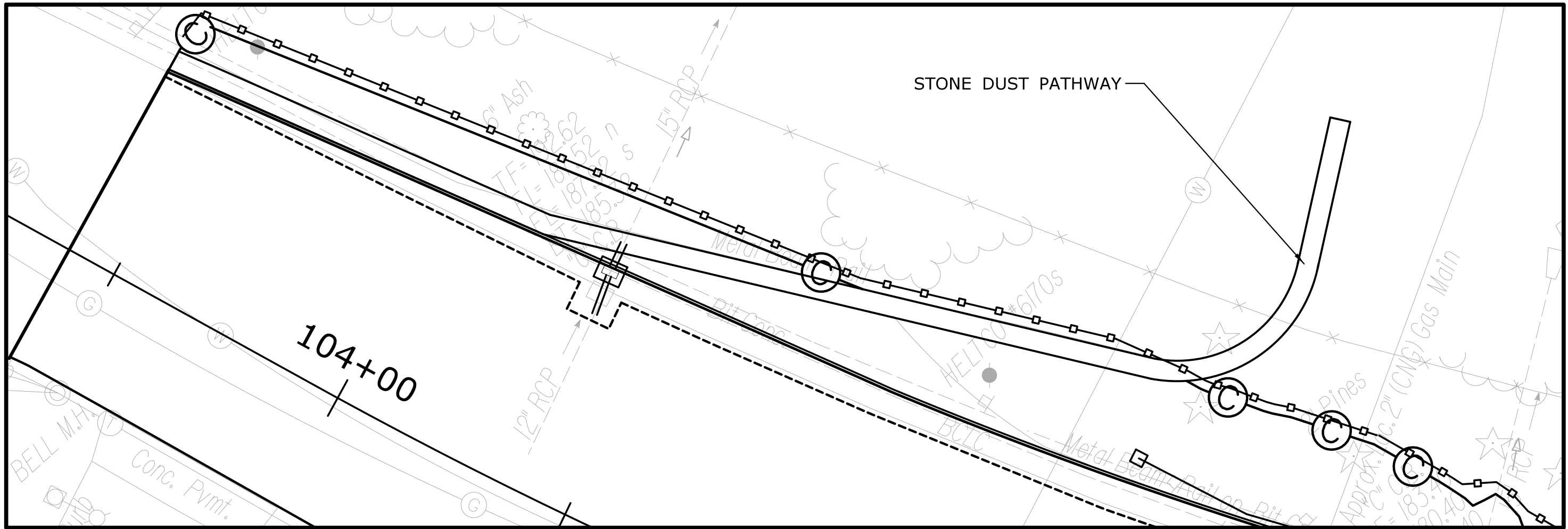


PLAN VIEW - INFILTRATION TRENCH - SECTION A-A

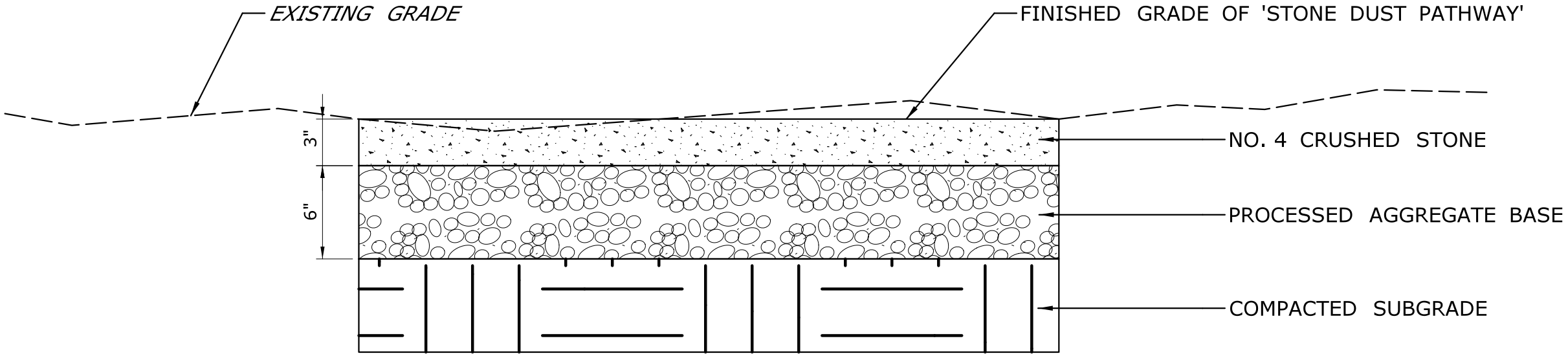


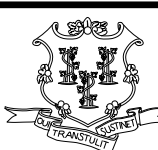

NOTES:
INFILTRATION TRENCH TO BE MEASURED AND PAID FOR AS 'TRENCH EX', '2" CRUSHED STONE' AND 'GEOTEXTILE'.

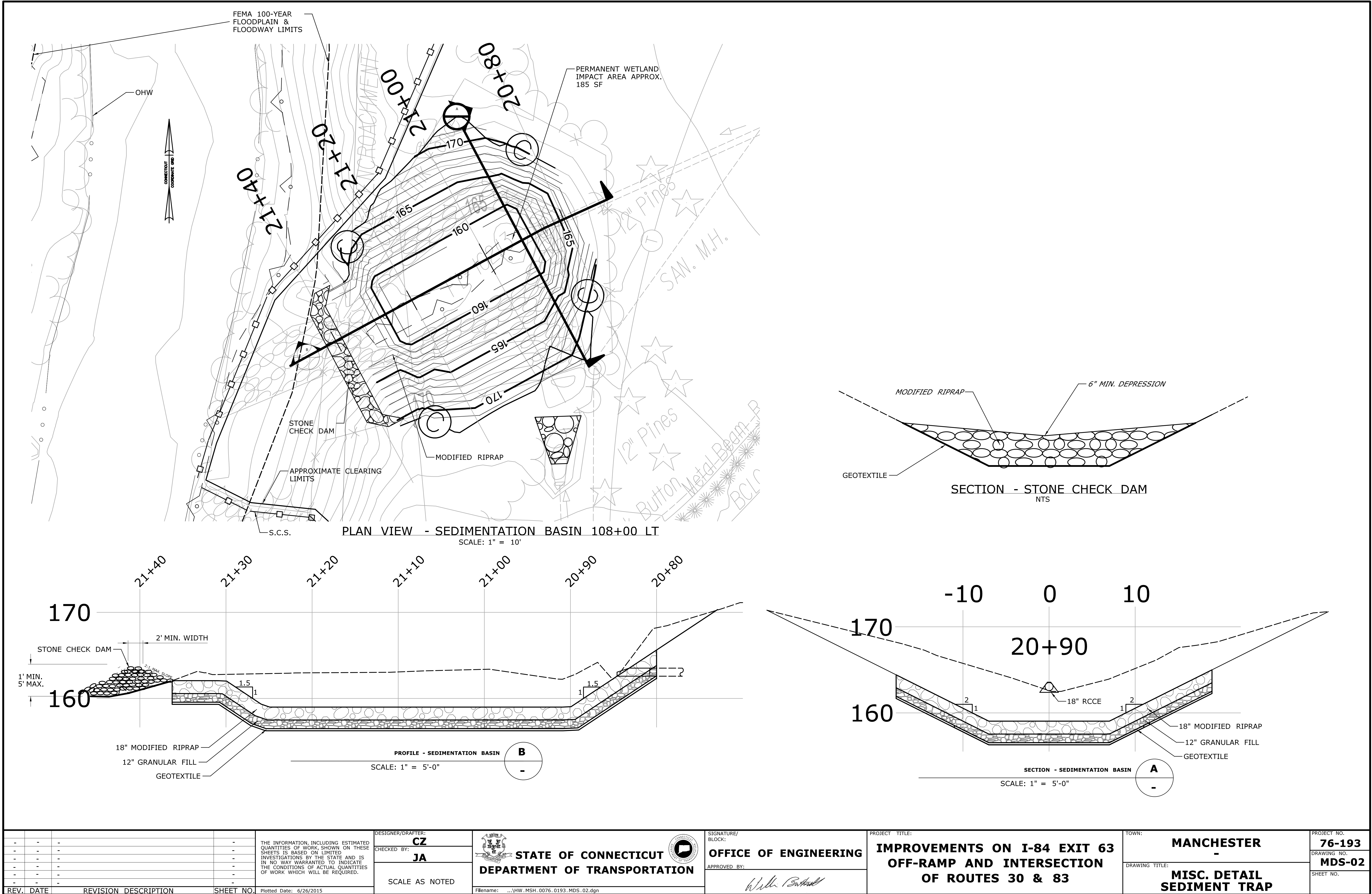
ALL MATERIALS NECESSARY FOR THE CONSTRUCTION OF 'STONE DUST PATHWAY' TO BE INCLUDED IN THE UNIT PRICE FOR ITEM 'STONE DUST PATHWAY' BUT SHALL CONFORM TO THE SPECIFICATIONS FOR EACH INDIVIDUAL ITEM AS DETAILED IN FORM 816 AND ANY SUPPLEMENTAL SPECIFICATIONS.

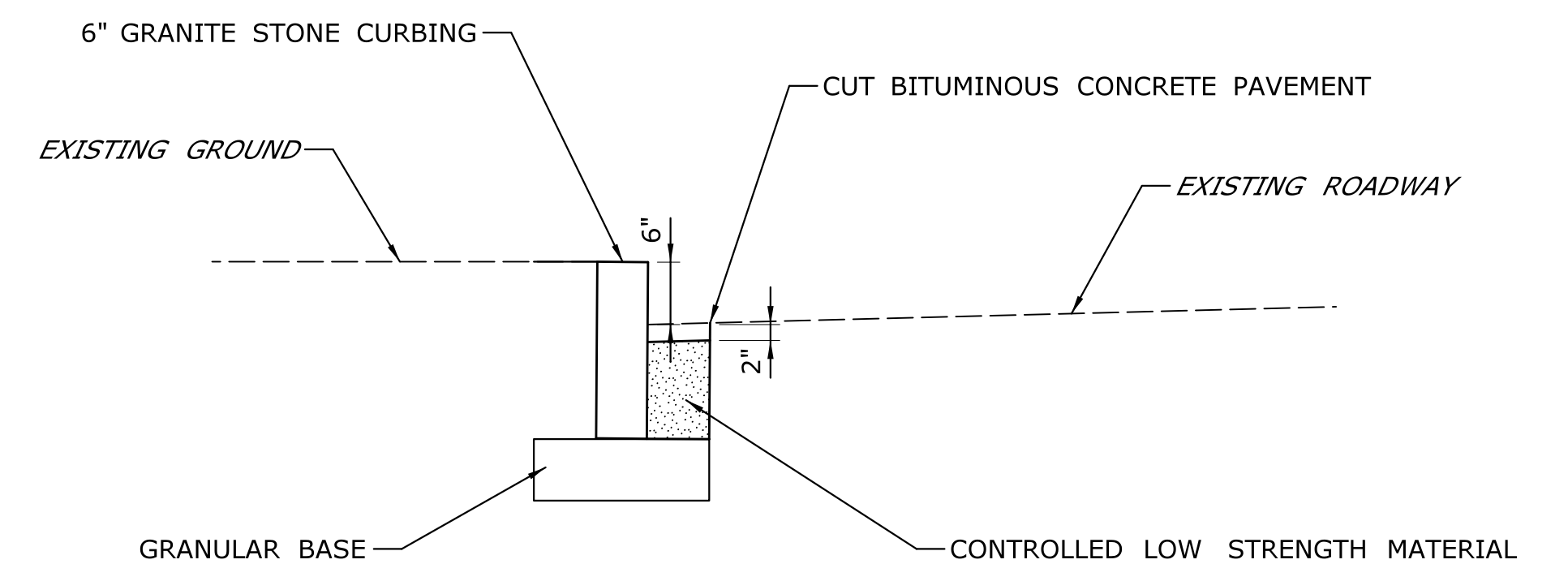
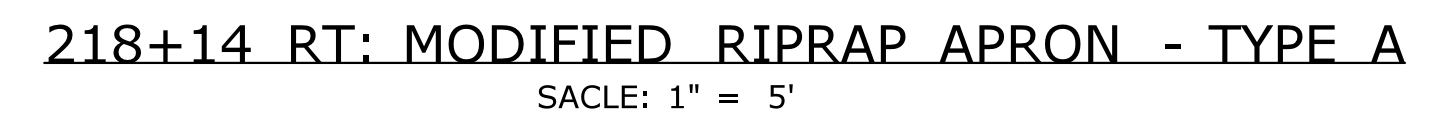
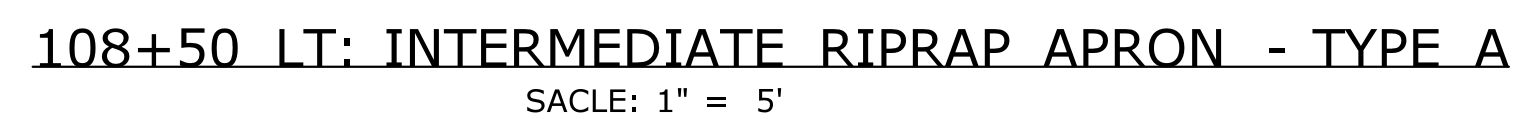


PLAN VIEW - STONE DUST PATHWAY - SECTION



				DESIGNER/DRAFTER: RB			STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION		SIGNATURE/ BLOCK:	PROJECT TITLE: IMPROVEMENTS ON I-84 EXIT 63 OFF-RAMP AND INTERSECTION	TOWN: MANCHESTER	PROJECT NO. 76-193
				CHECKED BY: JA	OFFICE OF ENGINEERING				DRAWING NO. MDS-01			
									APPROVED BY <i>Will B. Smith</i>		DRAWING TITLE: MISC DETAIL	SHEET NO.





STONE CURBING INSTALLATION IN AREAS OUTSIDE OF FULL DEPTH RECONSTRUCTION

CONTROLLED LOW STRENGTH MATERIAL SHALL CONFORM TO THE SPECIFICATIONS FOR
ITEM #216012A 'CONTROLLED LOW STRENGTH MATERIAL' AND PAID FOR PER C.Y.

GRANITE STONE CURBING SHALL BE INSTALLED IN ACCORDANCE WITH THE FORM 816 AND THE CTDOT STANDARD SHEETS. ALL WORK AND MATERIALS INCIDENTAL TO THE INSTALLATION OF GRANITE STONE CURBING SHALL BE INCLUDED IN THE UNIT COST FOR GRANITE STONE CURBING.

[illegible]



Connecticut Department of
Energy & Environmental Protection
Bureau of Materials Management & Compliance Assurance
Water Permitting & Enforcement Division

General Permit for the Discharge of Stormwater and Dewatering Wastewaters from
Construction Activities, issued 8/21/13, effective 10/1/13
Stormwater Monitoring Report

SITE INFORMATION

Permittee:	_____
Mailing Address:	_____
Business Phone:	_____ ext.: _____ Fax: _____
Contact Person:	_____ Title: _____
Site Name:	_____
Site Address:	_____
Receiving Water (name, basin):	_____
Stormwater Permit No.	<u>GSN</u> _____

SAMPLING INFORMATION (Submit a separate form for each outfall)

Outfall Designation:	_____	Date/Time Collected:	_____
Outfall Location(s) (lat/lon or map link):	_____		
Person Collecting Sample:	_____		
Storm Magnitude (inches):	_____	Storm Duration (hours):	_____
Size of Disturbed Area at any time:	_____		

MONITORING RESULTS

Sample #	Parameter	Method	Results (units)	Laboratory (if applicable)
1	Turbidity			
2	Turbidity			
3	Turbidity			
4	Turbidity			

(provide an attachment if more than 4 samples were taken for this outfall)

Avg =

STATEMENT OF ACKNOWLEDGMENT

I certify that the data reported on this document were prepared under my direction or supervision in accordance with the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. The information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Authorized Official: _____
Signature: _____ Date: _____

Please send completed form to:

DEPARTMENT OF ENERGY & ENVIRONMENTAL PROTECTION
BUREAU OF MATERIALS MANAGEMENT AND COMPLIANCE ASSURANCE
79 ELM STREET
HARTFORD, CT 06106-5127
ATTN: NEAL WILLIAMS

D-01



General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities

Notice of Termination Form

Please complete and submit this form in accordance with the general permit (DEP-PED-GP-015) in order to ensure the proper handling of your termination. Print or type unless otherwise noted.

Note: Ensure that for commercial and industrial facilities, registrations under the *General Permit for the Discharge of Stormwater Associated with Industrial Activity* (DEP-PED-GP-014) or the *General Permit for the Discharge of Stormwater from Commercial Activities* (DEP-PED-GP-004) have been filed where applicable. For questions about the applicability of these general permits, please call the Department at 860-424-3018.

Part I: Registrant Information

1. Permit number: **GSN**
2. Fill in the name of the registrant(s) as indicated on the registration certificate:
Registrant:
3. Site Address:
City/Town: _____ State: _____ Zip Code: _____
4. Date all storm drainage structures were cleaned of construction sediment:
Date of Completion of Construction: _____
Date of Last Inspection (must be at least three months after final stabilization pursuant to Section 6(b)(6)(D) of the general permit): _____
5. Check the post-construction activities at the site (check all that apply):
☐ Industrial ☐ Residential ☐ Commercial ☐ Capped Landfill
☐ Other (describe): _____

Part II: Certification

"I have personally examined and am familiar with the information submitted in this document and all attachments thereto, and I certify that, based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief. I understand that a false statement made in this document or its attachments may be punishable as a criminal offense, in accordance with Section 22a-6 of the Connecticut General Statutes, pursuant to Section 53a-157b of the Connecticut General Statutes, and in accordance with any other applicable statute."

Signature of Permittee

Date

Name of Permittee (print or type)

Title (if applicable)

Note: Please submit this Notice of Termination Form to:

STORMWATER PERMIT COORDINATOR
BUREAU OF WATER MANAGEMENT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
79 ELM STREET
HARTFORD, CT 06106-5127

State of Connecticut

Department of Transportation

SUPPLEMENTAL SPECIFICATIONS

TO

THE STANDARD SPECIFICATIONS

FOR

ROADS, BRIDGES AND INCIDENTAL CONSTRUCTION

FORM 816

2004

JANUARY 2015

January 2015

DIVISION I
GENERAL REQUIREMENTS AND COVENANTS

<u>SECTION</u>		<u>SPECIFICATION NUMBER</u>
1.01	Definition of Terms and Permissible Abbreviations	101
1.02	Proposal Requirements and Conditions	102
1.03	Award and Execution of Contract	103
1.05	Control of the Work	105
1.07	Legal Relations and Responsibilities	107
1.08	Prosecution and Progress	108
1.09	Measurement and Payment	109
1.10	Environmental Compliance	110
1.11	Claims	111
1.20	General Clauses for Facilities Construction	120

DIVISION II
CONSTRUCTION DETAILS

<u>SECTION</u>		<u>SPECIFICATION NO.</u>
2.02	Roadway Excavation, Formation of Embankment and Disposal of Surplus Material	202
2.05	Trench Excavation	205
2.12	Subbase	212
2.16	Pervious Structure Backfill	216
3.04	Processed Aggregate Base	304
4.01	Concrete for Pavement	401
5.08	Shear Connectors	508
5.14	Prestressed Concrete Members	514
6.01	Concrete for Structures	601
6.03	Structural Steel	603
6.12	Concrete Cylinder Curing Box	612
6.51	Culverts	651
7.01	Drilled Shafts	701
7.02	Piles	702
7.06	Micropiles	706
8.22	Temporary Precast Concrete Barrier Curb	822
9.10	Metal Beam Rail	910
9.18	Three-Cable Guide Railing (I-Beam Post) and Anchorages	918
9.22	Bituminous Concrete Sidewalk	922
	Bituminous Concrete Driveway	
9.44	Topsoil	944
9.49	Furnishing, Planting and Mulching	949
	Trees, Shrubs, Vines and Ground Cover Plants	
9.75	Mobilization and Project Closeout	975
9.77	Traffic Cone	977
9.78	Traffic Drum	978
9.79	Construction Barricades	979
9.80	Construction Staking	980
9.81	42 Inch (1 Meter) Traffic Cone	981
10.00	General Clauses for Highway Illumination and Traffic Signal Projects	1000
10.01	Trenching and Backfilling	1001
10.10	Concrete Handhole	1010
11.13	Control Cable	1113
12.07	Sign Face – Extruded Aluminum	1207
12.08	Sign Face – Sheet Aluminum	1208
12.10	Epoxy Resin Pavement Markings, Symbols and Legends	1210
12.20	Construction Signs	1220
18.00	General Clauses – Impact Attenuation Systems	1800
18.06	Type D Portable Impact Attenuation System	1806

January 2015

DIVISION III
MATERIALS SECTION

SECTION

**SPECIFICATION
NUMBER**

M.03	Portland Cement Concrete	M03
M.06	Metals	M06
M.08	Drainage	M08
M.11	Masonry Facing, Cement and Dry Rubble Masonry, Brick, Mortar	M11
M.13	Roadside Development	M13
M.16	Traffic Control Signals	M16
M.17	Elastomeric Materials	M17
M.18	Signing	M18

JANUARY 2015
STANDARD SPECIFICATIONS
FOR
ROADS, BRIDGES AND INCIDENTAL CONSTRUCTION
FORM 816

ERRATA

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
i	Table of Contents	20	Insert "1.11 Claims".....	July10
iii	Table of Contents	10	Insert "7.01 Drilled Shafts".....	July14
iii	Table of Contents	15	Insert "7.06 Micropiles".....	July14
iv	Table of Contents	11	Change "Guild" to "Guide"	Jan05
v	Table of Contents	2	Change "Mobilization" to "Mobilization and Project Closeout".....	July14
vi	Table of Contents	21	Change "Sign Face – Extruded Aluminum (Type III Reflective Sheeting)" to "Sign Face – Extruded Aluminum".....	Jan15
vi	Table of Contents	33	Change "Construction Signs – Encapsulated Lens Type III Reflective Sheeting" to "Construction Signs".....	Jan15
32	1.05.01	38	Change "Connecticut General Statutes" to "CGS".....	Jan05
97	1.10.03-2	32	Change "D.E.P." to "DEEP".....	Jan14
97	1.10.03-2	39	Change "D.E.P," to "DEEP,".....	Jan14
98	1.10.03-2.1	13	Change "D.E.P." to "DEEP".....	Jan14
99	1.10.03-2.6	23	Change "D.E.P." to "DEEP".....	Jan14
100	1.10.03-2.9	32	Change "D.E.P." to "DEEP".....	Jan14
101	1.10.03-2.12	22	Change "D.E.P." to "DEEP".....	Jan14
102	1.10.04	26	Change "D.E.P." to "DEEP".....	Jan14
105	1.20	29	Change "Workmen and Equipment" to "Personnel and Equipment".....	Jan05
105	1.20	31	Delete "Completion of Construction Work and".....	Jan05
108	1.20-1.04.01	26	Change "othewise" to "otherwise".....	July07
122	1.20-1.06.08	3	Change "Certificate of Compliance" to "C.O.C.".....	July07
131	1.20-1.08.05	34	Change "Workmen and Equipment" to "Personnel and Equipment".....	Jan05
132	1.20-1.08.11	12	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	7	Delete "Completion of Construction Work and".....	Jan05
133	1.20-1.08.13	9	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	15	Change "Certificate of Compliance" to "C.O.C.".....	July07
133	1.20-1.08.13	20	Change "Certificate of Compliance" to "C.O.C.".....	July07
164	2.04.03-1	2	Change "6.01.03-10" to "6.01.03-6".....	Jan14
196	3.03.02	33	Change "Article M.03.01" to "Section M.03".....	Jan14
203	3.05.05	21	Change "(t) to "(mton)".....	Jan15
230	4.03.05	38	Change "(t) to "(mton)".....	Jan15
245	4.06.04	11	Change " Over weight (mass) Adjustments - " and replace with indented "Over weight (mass) Adjustments -" as a subsection of " 1. Bituminous Concrete Class () .".....	Jan05
256	5.01.02	22	Change "DEP" to "DEEP".....	Jan14
259	5.03.03	24	Change "Such requirements of Article 5.02.03 ... equally to	

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
			this construction." to "All such plans prepared by the Contractor shall be considered working drawings and shall be submitted with engineering calculations to the Engineer for review in accordance with the requirements of Article 1.05.02.".....	July10
262	5.06.02	26	Change "Article M.03.01" to "Section M.03".....	Jan14
262	5.06.02	27	Change "Article M.03.01" to "Section M.03".....	Jan14
265	5.07.02	19	Change "Subarticle M.03.01-11" to "Article M.03.09".....	Jan14
265	5.07.02	23	Change "Approved Products List for Geotextiles referred to in Subarticle M.08.01-26." to "Qualified Products List referred to in Subarticle M.08.01-19 Geotextiles".....	July14
271	5.09.02	39	Change "M.06.02-12" to "M.06.02-4 Welded Stud Shear Connectors".....	July10
272	5.13.02	22	Change "M.08.01-27" to "M.08.01-20 PVC Pipe or M.08.01-21 PVC Gravity Pipe".....	July13
378	6.52.02	2	Change "M.08.01-22" to "M.08.01-11 Reinforced Concrete Culvert End".....	July13
378	6.52.02	3	Change "M.08.01-23" to "M.08.01-6 Metal Culvert End".....	July13
378	6.52.02	4	Change "gravel fill" to "granular fill".....	Jan15
378	6.52.03	12	Change "gravel fill" to "granular fill".....	Jan15
378	6.52.04	22	Change "gravel fill" to "granular fill".....	Jan15
378	6.52.05	35	Change "gravel fill" to "granular fill".....	Jan15
404	7.05.02	11	Change "Article M.03.01" to "Section M.03".....	Jan14
414	7.28.05	4	Change "(t) to "(mton)".....	Jan15
416	7.51.02-(4)	7	Change "M.08.01-26" to "M.08.01-19 Geotextiles".....	July13
418	7.55.02	26	Change "M.08.01-26" to "M.08.01-19 Geotextiles".....	July13
420	8.11.02	37	Change "Article M.03.01" to "Section M.03".....	Jan14
420	8.11.02	38	Change "Article M.03.01" to "Subarticle M.03.08-2".....	Jan14
421	8.11.02	1	Change "Article M.03.01" to "Section M.03".....	Jan14
421	8.11.03-4	42	Change "4.01.03 for concrete pavement" to " 6.01.03 Concrete for Structures".....	Jan15
422	8.11.04	12	Change "meters" to "linear feet (meters)".....	Jan15
426	8.16.02	28	Change "Subarticle M.03.01-8" to "Article M.03.08".....	Jan14
428	8.18.02	10	Change "Subarticle M.03.01-11" to "Article M.03.09".....	Jan14
429	8.21.02-6	30	Change "M.03.01-11" to "Article M.03.09".....	Jan14
430	8.21.03-6	37	Change "M.03.01-11" to "Article M.03.09".....	Jan14
434	9.04.02	14	Change "Subarticle M.06.02-1" to "Article 6.03.02".....	July10
434	9.04.02	15	Change "M.06.02-9(d) for metal bridge rail (cast post—aluminum)" to "Malleable castings shall conform to the requirements of the specifications for malleable iron castings, ASTM A 47, Grade No. 32510 (22010). Ductile iron castings shall conform to the Specifications for Ductile Iron Castings, ASTM A 536, Grade 60-40-18 (414-276-18) unless otherwise specified. In addition to the specified test coupons, test specimens from parts integral with the castings, such as risers, shall be tested for castings having a weight (mass) of more than 1000 pounds (455 kilograms) to determine that the required quality is obtained in the castings in the finished	

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
			condition.”.....	July10
445	9.11.02	14	Change “Subarticle M.03.01-12” to “Article M.03.05”.....	Jan14
452	9.14.02	2	Change “Subarticle M.06.02-8” to “ASTM A 53, Type E or S, Grade A, Schedule 40 Black Finish.”.....	July10
452	9.14.02	4	Change “Subarticle M.06.02-9(d) except that the grade shall be 32510” to “the specifications for malleable iron castings, ASTM A 47, Grade No. 32510 (22010). Ductile iron castings shall conform to the Specifications for Ductile Iron Castings, ASTM A 536, Grade 60-40-18 (414-276-18) unless otherwise specified. In addition to the specified test coupons, test specimens from parts integral with the castings, such as risers, shall be tested for castings having a weight (mass) of more than 1000 pounds (455 kilograms) to determine that the required quality is obtained in the castings in the finished condition.”.....	July10
454	9.16.02	20	Change “Article M.03.01” to “Section M.03”.....	Jan14
459	9.21.02	9	Change “Article M.03.01” to “Section M.03”.....	Jan14
459	9.21.02	17	Change “Article M.03.01” to “Section M.03”.....	Jan14
460	9.21.03-4	17	Change “4.01.03 for Concrete Pavement” to “6.01.03 Concrete for Structures”.....	Jan15
464	9.23.05	9	Change “ton (t)” to “ton (mton)”.....	Jan15
464	9.24.02-1	19	Change “Article M.03.01” to “Section M.03”.....	Jan14
471	9.42.05	9	Change “(t)” to “(mton)”....	Jan15
475	9.46.05	2	Change “(t)” to “(mton)”....	Jan15
475	9.47.02-5	34	Change “Article M.03.01” to “Section M.03”.....	Jan14
496	9.70.01	37	Change “CDOT” to “ConnDOT”.....	Jan05
517	10.00	21	Add “10.00.14—Maintenance of Illumination During Construction”.....	July14
518	10.00.03(2)	41	Change “pre-emotion” to “pre-emption”.....	July14
519	10.00.04	12	Capitalize “Section”.....	July14
519	10.00.04	18	Capitalize “Project”.....	July14
533	10.02.02	6	Change “Article M.03.01” to “Section M.03”.....	Jan14
544	10.11.02	5	Change “M.08.01-25 or M.08.01-27” to “M.08.01-20 or M.08.01-21”.....	July13
548	10.17.03	14	Change “6.01.03-21” to “6.01.03-10”.....	Jan14
552	11.03.03-1	18	Change “M.03.01-12” to “M.03.05”.....	Jan14
569	11.14.05	19	Change “Span Wire” to “Span Wire (Type)”.....	July12
576	12.01.02	40	Change “Subarticle M.03.01-12” to “Article M.03.05”.....	Jan14
577	12.01.03	7	Change “6.03.03-19” to “6.03.03-4 (f) High Strength Bolted Connections”.....	July10
577	12.01.03	23	Change “Article 6.03.03-15” to “Subarticle 6.03.03-4(c) Bearings”.....	July10
577	12.01.03	27	Change “Article 6.03.03-19 (c)(3)” to “Subarticle 6.03.03-4 (f) High Strength Bolted Connections Turn-of-Nut Installation Method”.....	July10
578	12.02.02	23	Change “M.03.01-12” to “M.03.05”.....	Jan14
580	12.02.03	16	Change “6.01.03-21” to “6.01.03-10”.....	Jan14

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
583	12.05.02	16	Change "either Subarticle M.18.09.01 (Type V) or M.18.09.02" to "Article M.18.09".....	Jan15
583	12.05.04	35	Change "12.05.040" to "12.05.04".....	July14
604	18.02.02	36	Change "Approved Products List" to "Qualified Products List".....	July14
609	18.07.02	30	Change "M18" to "M.18".....	July14
638	M.04.02	37	Change "Asphalt Institute's" to "AI's".....	Jan05
705	M.09.02-2	18	Change "Article M.09.02(1)" to "Subarticle M.09.02-1".....	July14
708	M.09.02-5	5	Change "Article M.03.01" to "Section M.03".....	Jan14
708	M.09.02-6	40	Change "Article M.03.01-2" to "Subarticle M.03.01-2".....	July14
711	M.10.02-1	17	Change "Subarticle M.06.02-1(b)" to "Article M.06.02".....	July10
713	M.10.02-7	8	Change "Article M.03.01" to "Section M.03".....	Jan14
720	M.10.08-3	2	Change "Subarticle M.06.02-1(b)" to "Article M.06.02".....	July10
720	M.10.08-4	10	Change "Article M.03.01" to "Section M.03".....	Jan14
726	M.12.03	18	After "M.03.01" add "and M.03.02".....	Jan14
731	M.12.08-3	20	Change "Article M.06.01-1" to "Subarticle M.06.01-1".....	July14
748	M.14.01-3	42	Change "Article M.06.01-1" to "Subarticle M.06.01-1".....	July14
749	M.14.01-4	2	Change "Article M.08.01-5" to "Subarticle M.08.01-5".....	July14
749	M.14.01-7	22	Change "Article M.14.01-2" to "Subarticle M.14.01-2".....	July14
749	M.14.01-8	32	Change "Article M.03.01-12" to "Article M.03.05".....	Jan14
758	M.15.10	9	Change "Article M.15.09-1" to "Subarticle M.15.09-1".....	July14
759	M.15.15-4	23	Change "Article M.16.03.2" to "Subarticle M.16.03-2".....	July14
759	M.15.15-5	26	Change Article M.15.02.2" to "Subarticle M.15.02-2".....	July14
759	M.15.15-5	24	Change "Article M.03.01" to "Section M.03".....	Jan14
759	M.15.15-6	27	Change "Article M.03.01" to "Section M.03".....	Jan14
760	M.15.15-16	21	Change "non-fusible" to "fused".....	Jan05
823	Pay Items	28	Change "ton (t)" to "ton (mton)".....	Jan15
823	Pay Items	29	Change "ton (t)" to "ton (mton)".....	Jan15
823	Pay Items	35	Change "ton (t)" to "ton (mton)".....	Jan15
824	Pay Items	4	Change "ton (t)" to "ton (mton)".....	Jan15
825	Pay Items	25	Change "l.s. (l.s.)" to "ea. (ea.)".....	Jan15
828	Pay Items	29	Add "7.01, Furnishing Drilled Shaft Drilling Equipment, l.s. (l.s.)".....	July14
828	Pay Items	30	Add "7.01, Drilled Shaft (Diameter), l.f. (m).....	July14
828	Pay Items	31	Add "7.01, Drilled Shaft Earth Excavation (Diameter), l.f. (m)".....	July14
828	Pay Items	32	Add "7.01, Drilled Shaft Rock Excavation (Diameter), l.f. (m)".....	July14
828	Pay Items	33	Add "7.01, Obstructions, hr. (hr.)".....	July14
828	Pay Items	34	Add "7.01, Trial Drilled Shaft (Diameter), l.f. (m)".....	July14
828	Pay Items	35	Add "7.01, Exploration Test Boring, l.f. (m)".....	July14
828	Pay Items	36	Add "7.01, Permanent Casing (Diameter), l.f. (m)".....	July14
828	Pay Items	37	Add "7.01, Access Tubes, l.f. (m)".....	July14
829	Pay Items	4	Add "7.02, Dynamic Pile Driving Analysis (PDA) Test, ea. (ea.)".....	July13
829	Pay Items	5	Add "7.02, Pre-Augering of Piles, l.f. (m)".....	July13
829	Pay Items	13	Add "7.06, Micropiles, ea. (ea.)".....	July14

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
829	Pay Items	14	Add "7.06, Verification Test for Micropiles, ea. (ea.)".....	July14
829	Pay Items	15	Add "7.06, Proof Test for Micropiles, ea. (ea.)".....	July14
829	Pay Items	16	Add "7.06, Micropile Length Adjustment, l.f. (m)".....	July14
829	Pay Items	24	Change "ton (t)" to "ton (mton)".....	Jan15
833	Pay Items	20	Change "ton (t)" to "ton (mton)".....	Jan15
834	Pay Items	4	Change "ton (t)" to "ton (mton)".....	Jan15
835	Pay Items	3	Change "Mobilization" to "Mobilization and Project Closeout".....	July14
837	Pay Items	24	Change "Span Wire" to "Span Wire (Type)".....	July12
839	Pay Items	3	Change "Sign Face – Extruded Aluminum (Type III Reflective Sheeting)" to "Sign Face – Extruded Aluminum".....	Jan15
840	Pay Items	6	Change "Construction Signs – Type III Reflective Sheeting" to "Construction Signs".....	Jan15
845	Index	6	Add page 133 to "Acceptance of Project".....	Jan05
846	Index	13	Add page 107 to "Bids: Consideration of".....	Jan05
847	Index	28	Add page 132 to "Cleaning Up, Final".....	Jan05
849	Index	25	Add page 107 to "Consideration of Bids".....	Jan05
849	Index	39	Add page 108 to "Contract: Intent of".....	Jan05
850	Index	3	Add page 133 to "Contractor's: Responsibility, Termination of the".....	Jan05
850	Index	13	Add page 114 to "Cooperation by Contractor".....	Jan05
850	Index	15	Add page 114 to "Coordination of Special Provisions, Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
850	Index	40	Add page 128 to "Cutting and Patching:".....	Jan05
852	Index	16	Add page 106 to "Examination of Plans, Specifications, Special Provisions and Site of Work".....	Jan05
852	Index	38	Insert "Facilities, Temporary...126".....	Jan05
853	Index	7	Add page 132 to "Final: Cleaning Up".....	Jan05
854	Index	35	Add page 115 to "Inspection".....	Jan05
855	Index	11	Add page 108 to "Intent of Contract".....	Jan05
855	Index	22	Add page 106 to "Knowledge of Applicable Laws".....	Jan05
855	Index	25	Add page 106 to "Laws: Knowledge of Applicable".....	Jan05
856	Index	27	Add page 120 to "Materials: Source of Supply and Quality"....	Jan05
856	Index	28	Add page 121 to "Materials: Storage of".....	Jan05
857	Index	33	Add page 133 to "Operation and Maintenance Manuals:".....	Jan05
857	Index	34	Change page 133 to 136 for "Equipment and Systems Maintenance Manual".....	Jan05
859	Index	2	Add page 131 to "Personnel and Equipment".....	Jan05
860	Index	6	Add page 114 to "Plans: Coordination of Special Provisions, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
860	Index	7	Add page 106 to "Plans: Examination of".....	Jan05
860	Index	30	Change page 108 to 112 for "Product Data".....	Jan05
860	Index	31	Change page 108 to 112 for "Product Samples".....	Jan05
860	Index	32	Add page 124 to "Product Selection:".....	Jan05

<u>PG.</u>	<u>ARTICLE OR SUBARTICLE</u>	<u>LINE NO.</u>	<u>CORRECTION</u>	<u>REV. DATE</u>
861	Index	12	Add page 126 to "Prosecution of Work".....	Jan05
861	Index	38	Change page 115 to 135 for "Record Drawings".....	Jan05
863	Index	3	Add page 125 to "Sanitary Provisions".....	Jan05
863	Index	18	Insert "Services, Temporary...126".....	Jan05
863	Index	23	Add page 111 to "Shop Drawings".....	Jan05
864	Index	4	Add page 106 to "Site of Work, Examination of".....	Jan05
864	Index	12	Add page 120 to "Source of Supply and Quality".....	Jan05
864	Index	19	Add page 114 to "Special Provisions: Coordination of Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements".....	Jan05
864	Index	20	Add page 106 to "Special Provisions: Examination of".....	Jan05
864	Index	26	Add page 114 to "Specifications: Coordination of Plans, Special Provisions and Other Contract Requirements".....	Jan05
864	Index	27	Add page 106 to "Specifications: Examination of".....	Jan05
864	Index	43	Add page 121 to "Storage".....	Jan05
865	Index	27	Delete page 108 from "Submittals: Shop Drawings".....	Jan05
865	Index	45	Insert "Temporary Utilities, Services, and Facilities...126"....	Jan05
866	Index	2	Add page 133 to "Termination of Contractor's Responsibility".....	Jan05
866	Index	23	Insert "Training...137".....	Jan05
866	Index	45	Add page 133 to "Utility Services".....	Jan05
867	Index	8	Insert "Warranties...121".....	Jan05
867	Index	24	Add page 126 to "Work: Prosecution of".....	Jan05

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.01
DEFINITIONS OF TERMS AND
PERMISSIBLE ABBREVIATIONS**

1.01.01 — Definitions:

After the definition for “Award” add the following definition:

“BID: The submission of a proposal for the work contemplated.”

After the definition for “Bid Manual” add the following definition:

“BIDDER: Any individual, firm, partnership, corporation, or combination thereof, submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.”

After the definition for “Calendar Day” add the following definition:

“CATALOG CUT (PRODUCT DATA): Document(s) with information such as manufacturer’s product specifications, manufacturer’s installation instructions, standard color charts, wiring diagrams showing factory-installed wiring, printed performance curves and operational range diagrams. Product data that must be specially prepared because standard printed data is not suitable shall be considered shop drawings.”

*Change the title of “**Construction Order**” to “**Construction Order, Change Order**.”*

After the definition for “Contractor” add the following definition:

“CULVERT: A covered channel or a large pipe for carrying a watercourse below ground level, usually under a road or railway.”

After the definition for “Material” add the following definitions:

“MUNICIPALITY: City, town or county.

NOTICE TO PROCEED: A written notice issued by the Engineer to the Contractor stating the date on which the Contractor is authorized to commence and proceed with the Contract work.”

After the end of the definition for “Plans” insert the following:

“A. Standard Sheets – Standardized plans containing details approved by the Department and the FHWA, for construction of a given type on any project, included in contracts on an as-needed basis.

PRODUCT DATA (CATALOG CUT): Document(s) with information such as manufacturer's product specifications, manufacturer's installation instructions, standard color charts, wiring diagrams showing factory-installed wiring, printed performance curves and operational range diagrams. Product data that must be specially prepared because standard printed data is not suitable shall be considered shop drawings."

After the definition for "Project Site" add the following definition:

"QUALIFIED PRODUCTS LIST: A report that has been developed as a means for determining what products, suppliers, manufacturers, equipment and methodologies may be used on construction projects. This report can be located on the CT Department of Transportation Website."

After the definition for "Reclaimed Waste" add the following definition:

"RIGHT-OF-WAY: A general term denoting land, property of interest therein, usually in a strip, acquired for or devoted to transportation purposes."

After the definition for "Subcontractor" add the following definition:

"SUBSTANTIAL COMPLETION: The date at which the performance of all work on the Project has been completed except minor or incidental items, final cleanup, work required under a warranty, and repair of unacceptable work, and provided the Engineer has determined that:

- A. The Project is safe and convenient for use by the public, and
- B. All traffic lanes including all safety appurtenances are in their final configuration, and
- C. Failure to complete the work and repairs excepted above does not result in the deterioration of other completed work; and provided further, that the value of work remaining to be performed, repairs, and cleanup is less than one percent (1%) of the estimated final Contract amount, and
- D. If applicable a Certificate of Compliance has been issued."

1.01.02 — Abbreviations, Publications, and Standards:

Delete the entire Article and replace with the following:

" 1.01.02—Abbreviations, Publications and Standards: Whenever one of the following abbreviations is used in the Contract, its meaning shall be interpreted as follows:

AA—Aluminum Association, Inc. (The)

AABC—Associated Air Balance Council

AAMA—American Architectural Manufacturers Association

AAPA—American Association of Port Authorities

AASHTO—American Association of State Highway and Transportation Officials:

Wherever reference is made to an AASHTO Standard Method of Test or Standard Specification, it refers by letter and number to the method or specification published by

AASHTO in the "Standard Specifications for Transportation Materials and Methods of Sampling and Testing". The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.

ABMA—American Bearing Manufacturers Association

ACGIH—American Council of Government Industrial Hygienists

ACI—ACI International (American Concrete Institute)

ADAAG—Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

ADSC—The International Association of Foundation Drilling

AF&PA—American Forest & Paper Association

AGA—American Gas Association

AGC—Associated General Contractors of America (The)

AHA—American Hardboard Association

AHAM—Association of Home Appliance Manufacturers

AI—Asphalt Institute

AIA—The American Institute of Architects (The)

AISC—American Institute of Steel Construction

AISI—American Iron and Steel Institute

AITC—American Institute of Timber Construction

A.L.I.—Automotive Lift Institute

ALSC—American Lumber Standard Committee, Incorporated

AMCA—Air Movement and Control Association International, Inc.

ANLA—American Nursery and Landscape Association

ANSI—American National Standards Institute

AOAC—AOAC International

AOSA—Association of Official Seed Analysts

APA—APA-The Engineered Wood Association

API—American Petroleum Institute

AREMA—American Railway Engineering and Maintenance-of-Way Association

ARI—Air-Conditioning & Refrigeration Institute

ARTBA—American Road and Transportation Builders Association

ASA—Acoustical Society of America

ASC—Adhesive and Sealant Council

ASCE—American Society of Civil Engineers

ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASME—ASME International (The American Society of Mechanical Engineers International)

ASNT—American Society for Non-Destructive Testing

ASSE—American Society of Sanitary Engineering

ASTM—American Society of Testing and Materials (ASTM International): Wherever reference is made to an ASTM specification, test method, or practice, it refers by letter, number, or both to standards published by ASTM International in the "ASTM Standards SourceTM Database". The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.

ATSSA—American Traffic Safety Services Association

AWI—Architectural Woodwork Institute

AWPA—American Wood-Preservers' Association

AWPI—American Wood Preservers Institute

AWS—American Welding Society: Wherever reference is made to an AWS materials specification, inspection methods, or welding procedures, it refers by section number to standards of the American Welding Society published in the applicable steel, or aluminum welding code. The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids shall govern.

AWWA—American Water Works Association

BHMA—Builders Hardware Manufacturers Association

BIA—Brick Industry Association (The)

BOCA—BOCA International, Inc.

CBM—Certified Ballast Manufacturers Association

CCRL—Cement and Concrete Reference Laboratory

CDA—Copper Development Association (The)

CGA—Compressed Gas Association

CISCA—Ceilings and Interior Systems Construction Association

CLFMI—Chain Link Fence Manufacturers Institute

ConnDOT—Connecticut Department of Transportation

CFR—Code of Federal Regulations

CGS—Connecticut General Statutes

CISPI—Cast Iron Soil Pipe Institute

CRI—Carpet and Rug Institute (The)

CRSI—Concrete Reinforcing Steel Institute

CSI—Construction Specifications Institute (The)

CSSB—Cedar Shake & Shingle Bureau

CTI—Cooling Technology Institute

DASMA—Door and Access Systems Manufacturers Association, International

~~DEP—Connecticut Department of Environmental Protection~~ *see DEEP*

DEEP—Connecticut Department of Energy and Environmental Protection

DHI—Door and Hardware Institute

DOD—Department of Defense Military Specifications and Standards

~~DPUC—Department of Public Utility Control~~ *see PURA*

EIA—Electronic Industries Alliance

EPA—Environmental Protection Agency

FAA—Federal Aviation Administration

FCC—Federal Communications Commission

FCICA—Floor Covering Installation Contractors Association

FHWA—Federal Highway Administration

FMG—FM Global

FRA—Federal Railway Administration

FS—Wherever reference is made to FS in the contract, it refers by number, letter, or both, to the latest standard or tentative standard of the Federal Specification Unit, General Services Administration, Federal Supply Service, as to materials, specifications, or methods of testing, whichever the case may be.

FTA—Federal Transit Administration

HPVA—Hardwood Plywood & Veneer Association

GA—Gypsum Association

GANA—Glass Association of North America

GSA—General Services Administration

HI—Hydraulics Institute

HPVA—Hardwood Plywood & Veneer Association

ICC—International Code Council
 ICC-ES—ICC Evaluation Service, Inc.
 ICEA—Insulated Cable Engineers Association, Inc.
 IEC—International Electrotechnical Commission
 IEEE—Institute of Electrical and Electronics Engineers, Inc. (The)
 IES—Illuminating Engineers Society
 IESNA—Illuminating Engineering Society of North America
 IGCC—Insulating Glass Certification Council
 IGMA—Insulating Glass Manufacturers Alliance
 IMSA—International Municipal Signal Association
 IRI—HSB Industrial Risk Insurers
 ISO—International Organization for Standardization
 ITE—Institute of Traffic Engineers
 KCMA—Kitchen Cabinet Manufacturers Association
 LMA—Laminating Materials Association
 LPI—Lightning Protection Institute
 MASH—Manual for Assessing Safety Hardware
 MBMA—Metal Building Manufacturers Association
 MILSPEC—Military Specification and Standards
 MMA—Monorail Manufacturers Association
 MSHA—Mine Safety and Health Administration
 MSS—Manufacturers Standardization Society of The Valve and Fittings the Valve Industry, Inc.
 MUTCD—Manual on Uniform Traffic Control Devices
 NAAMM—National Association of Architectural Metal Manufacturers
 NADCA—National Air Duct Cleaners Association
 NAIMA—North American Insulation Manufacturers Association (The)
 NBFU—National Board of Fire Underwriters
 NCHRP—National Cooperative Highway Research Program
 NCMA—National Concrete Masonry Association
 NCPI—National Clay Pipe Institute
 NEBB—Natural Environmental Balancing Bureau
 NEC—National Electrical Code
 NECA—National Electrical Contractors Association
 NEMA—National Electrical Manufacturers Association
 NEPCOAT—North East Protective Coatings Committee
 NESC—National Electrical Safety Code
 NETA—InterNational Testing Association
 NFPA—National Fire Protection Association
 NFRC—National Fenestration Rating Council
 NHLA—National Hardwood Lumber Association
 NICET—National Institute for Certification in Engineering Technologies
 NIOSH—National Institute of Occupational Safety and Health
 NIST—National Institute of Standards and Technology
 NLGA—National Lumber Grades Authority
 NOAA—National Oceanic and Atmospheric Administration
 NRCA—National Roofing Contractors Association
 NSF—NSF International
 NTMA—National Terrazzo and Mosaic Association, Inc.

OEO—Office of Equal Opportunity
 OSHA—Occupational Safety and Health Administration
 PCA—Portland Cement Association
 PCI—Precast/Prestressed Concrete Institute
 PDI—Plumbing & Drainage Institute
 PTI—Post-Tensioning Institute
 PURA—Public Utilities Regulatory Authority
 RMA—Rubber Manufacturers Association
 SAE—SAE International
 SDI—Steel Deck Institute *or*
—Steel Door Institute
 SFPA—Southern Forest Products Association
 SHRP—Strategic Highway Research Program
 SJI—Steel Joist Institute
 SMACNA—Sheet Metal and Air Conditioning Contractors National Association
 SPIB—Southern Pine Inspection Bureau (The)
 SPRI—Single Ply Roofing Institute
 SSPC—Where reference is made to SSPC in the Contract, it refers by number, letter, or both, to the latest standard or tentative standard specification of The Society for Protective Coatings, Formerly the Steel Structures Painting Council, as to materials specifications, methods of testing, systems, procedures, inspection or other specification pertaining to any or all phases of cleaning or painting, whichever may apply.
 SWRI—Sealant, Waterproofing, & Restoration Institute
 TCA—Tile Council of America, Inc.
 TIA—Telecommunications Industry Association
 TIA/EIA—Telecommunications Industry Association/Electronics Industries Alliance
 TPI—Truss Plate Institute, Inc.
 TRB—Transportation Research Board
 UFAS—Uniform Federal Accessibility Standards
 UL—Underwriters Laboratories Inc.
 USDA—United States Department of Agriculture
 USGBC—U.S. Green Building Council
 WCLIB—West Coast Lumber Inspection Bureau
 WCSC—Window Covering Safety Council
 WDMA—Window & Door Manufacturers Association
 WWPA—Western Wood Products Association”

1.01.03 — Abbreviations and Terms:

Add the following abbreviations:

“ACSR – Aluminum Conductor, Steel Reinforced
AOEC – Area of Environmental Concern
APA – Aquifer Protection Area
AWG – American Wire Gauge
CMS – Changeable Message Sign

cu.dm - Cubic Decimeter
cu.m - Cubic Meters
CWI – Certified Welding Inspector
dm³ - Cubic Decimeter
DMT – Division of Materials Testing
DTI – Direct Tension Indicator
est. – estimated
FRC – Fiberglass Reinforced Composite
HASP – Health and Safety Plan
m² - Square Meter
m³ - Cubic Meters
mton - Metric Ton
NDT – non-destructive testing
PCC – Portland Cement Concrete
sq.m - Square Meter
SSA – Sole Source Aquifer
TL – Test Level
TMA – Truck Mounted Impact Attenuator
TMP – Transportation Management Plan
TTC – Temporary Traffic Control
Vert. M - Vertical Meter
vert.m - Vertical Meter
VMS – Variable Message Sign
VOC – Volatile Organic Compound
WSA – Temporary Waste Stockpile Area”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.02
PROPOSAL REQUIREMENTS AND CONDITIONS**

1.02.01—Contract Bidding and Award

Replace the entire article with the following:

“1.02.01—Contract Bidding and Award: All bids for construction contracts must be submitted electronically. It is the responsibility of each bidder and all other interested parties to obtain all bidding related information and documents from the Department of Administrative Services (DAS) State Contracting Portal.

Connecticut Department of Transportation bidding and other information and documents which are obtained from any other source must not be submitted to the Department. Reproduced, reformatted or altered forms of documents are not authorized or acceptable.

For information about the bidding and award of Department construction contracts, consult the “State of Connecticut Department of Transportation Construction Contract Bidding and Award Manual,” available from the Division of Contracts. In order to be eligible for award of a Department construction contract, a bidder must follow the requirements of this Bid Manual, and all bidding and award matters regarding Department construction contracts shall be governed by the terms of the Bid Manual, unless treated otherwise in the Contract, including these Specifications.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.03
AWARD AND EXECUTION OF CONTRACT**

Replace Article 1.03.07 in its entirety with the following:

1.03.07—Insurance:

Coverage shall be on a primary basis.

The Contractor shall carry and maintain at all times during the term of the Contract the insurance coverages required by this Article and any additional coverages(s) or higher minimum insurance coverage amount(s) required by the Special Provisions of the Contract.

If the Project includes work on or adjacent to railroad property additional insurance may be required as specified by the railroad. Please refer to the Special Provisions for any additional insurance requirements by the railroad.

1. Worker's Compensation Insurance: With respect to all operations the Contractor performs and all those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Workers' Compensation insurance as required by the laws of the State of Connecticut.

Employer's Liability insurance shall be provided in amounts not less than \$100,000 per accident for bodily injury by accident; \$100,000 policy limit by disease and \$100,000 per employee for bodily injury by disease. Each Workers' Compensation policy shall contain the U.S. Longshoreman's and Harbor Workers' Act endorsement when work is to be performed over or adjacent to navigable water.

2. Commercial General Liability Insurance: With respect to the operations the Contractor performs and also those performed for it by subcontractors, the Contractor shall carry, and require each subcontractor to carry, Commercial General Liability insurance, including Contractual Liability, Products and Completed Operations, Broad Form Property Damage and Independent Contractors.

Products and completed operations insurance for ongoing and completed operations shall be maintained for a period of one (1) year after the acceptance of the project by the Department in accordance with Article 1.08.14. See chart below for applicable minimum coverage amounts.

Contract Amount (\$)	Minimum Single Occurrence Amount (\$)	Minimum Annual Aggregate Amount (\$)
0-2,000,000	1,000,000	2,000,000
>2,000,001-10,000,000	2,000,000	4,000,000
>10,000,000	4,000,000	8,000,000

In Facilities construction projects, if underground work is to be undertaken, each policy shall have coverage for and exclusions removed for “Explosion, Collapse and Underground” (“XCU”).

3. Automobile Liability Insurance: The Contractor shall obtain automobile liability insurance covering the operation of all motor vehicles, including those hired or borrowed, that are used in connection with the Project for all damages arising out of: (1) bodily injury to or death of all persons and/or (2) injury to or destruction of property; in any one accident or occurrence. This policy shall not be subject to an annual aggregate limitation. See chart above for applicable minimum coverage amounts.

4. Owner’s and Contractor’s Protective Liability Insurance for and in the Name of the State: With respect to the Contractor’s Project operations and also those of its subcontractors, the Contractor shall carry, for and on behalf of the State for each accident or occurrence resulting in damages from (1) bodily injury to or death of persons and/or (2) injury to or destruction of property. See chart below for applicable minimum coverage amounts.

Contract Amount (\$)	Minimum Single Occurrence Amount (\$)	Minimum Annual Aggregate Amount (\$)
0 - 20 Million	1,000,000	1,000,000
20 Million - 50 Million	2,000,000	2,000,000
> 50 Million	4,000,000	4,000,000

5. Railroad Protective Liability Insurance: When the Contract involves work within fifty (50) feet of the railroad right-of-way or State-owned rail property, with respect to Project operations and also those of its subcontractors, the Contractor shall carry Railroad Protective Liability Insurance providing coverage of at least \$2,000,000 for each accident or occurrence resulting in damages from (1) bodily injury to or death of all persons and/or (2) injury to or destruction of property, and subject to that limit per accident or occurrence, an aggregate coverage of at least \$6,000,000 for all damages during the policy period, and with all entities falling within any of the following listed categories named as insured parties: (i) the owner of the railroad right-of-way, (ii) the owner of any railcar licensed or permitted to travel within that affected portion of railroad right-of-way, and (iii) the operator of any railcar licensed or permitted to travel within that affected portion of the railroad right-of-way, and with the State, if not falling within any of the above-listed categories, also named as an insured party.

6. Blasting: When explosives are to be used in the Project, the Commercial General Liability insurance policy shall include XCU coverage, in the same limits as the per occurrence policy limits.

7. Protection and Indemnity Insurance for Marine Construction Operations in Navigable Waters:

If a vessel of any kind will be involved in Project work, the Contractor shall obtain the following additional insurance coverage:

A. Protection and Indemnity Coverage of at least \$300,000 per vessel or equal to at least the value of hull and machinery, whichever is greater.

B. If there is any limitation or exclusion with regard to crew and employees under the protection and indemnity form, the Contractor must obtain and keep in effect throughout the Project a workers' compensation policy, including coverage for operations under admiralty jurisdiction, with a limit of liability of at least \$300,000 per accident or a limit equal to at least the value of the hull and machinery, whichever is greater, or for any amount otherwise required by statute.

8. Builder's Risk Insurance: For Facilities construction projects, the Contractor shall maintain comprehensive replacement cost builder's risk (completed value) insurance providing coverage for the entire work at the Project site, including all fixtures, machinery and equipment, any heating, cooling and constituting a permanent part of the building and shall cover portions of work located away from the site, but intended for use at the site. If it is determined that all or a portion of the project is located within an area designated as a Special Flood Hazard Area, the Contractor shall maintain flood insurance (no less than \$10,000,000 sublimit). The State of Connecticut shall be named as Loss Payee. Equipment breakdown coverage may be sub limited to 50% of the project cost.

9. Architects and Engineer's Professional Liability Insurance for Structural Engineer: If required, limits will be specified in Article 1.03.07 of the Special Provisions of the Contract or Article 1.05.02.

10. Umbrella Liability Insurance: The Contractor may satisfy the minimum limits required for Commercial General Liability and Automobile Liability Insurance using Umbrella Liability Insurance. In the event that the Contractor obtains Umbrella Liability Insurance to meet the minimum coverage requirements for Commercial General Liability or Automobile Liability Insurance coverage, the Umbrella Liability Insurance policy shall have an annual aggregate at a limit not less than twice the single occurrence and must specifically endorse the State of Connecticut as an additional insured. Specifically for Bridge Projects with a low bid equal to or higher than \$80,000,000, the Umbrella Liability Insurance policy must have a minimum limit of at least \$25,000,000.

11. Certificate of Insurance: Before the Contract is executed, the Contractor must provide to the Department a certificate of insurance acceptable to the Commissioner and executed by an insurance company or companies satisfactory to the State of Connecticut for the insurance coverage(s) required by this Article and the Special

Provisions of the Contract. The Contractor shall maintain the required insurance coverage during the entire term of the Contract. The certificate of insurance must clearly include the name of the insured and identify the project for which it is being issued.

12. Copies of Policies: The Contractor shall provide, within five (5) business days, a copy or copies of all applicable insurance policies when requested by the State. In providing said policies, the Contractor may redact provisions of the policy that are proprietary. This provision shall survive the expiration or termination of the Contract.

13. Sovereign Immunity: The Contractor may not assert the defense of sovereign immunity in the adjustment of claims or in the defense of any claim or suit brought against the Contractor or the State, unless the State, in writing, requests that the Contractor do so or consents to its doing.

14. Contractor Assumes Costs: The Contractor shall assume and pay all costs and billings for premiums, deductibles, self-insured retentions and audit charges earned and payable under the required insurance.

15. State Named as Additional Insured: The State must be named as an additional insured party for the Commercial General Liability and Automobile Liability insurance policies required by this Article and the Special Provisions to the Contract, and any Umbrella Liability Insurance, as applicable, obtained in accordance with this Article. Each policy shall waive right of recovery (waiver of subrogation) against the State of Connecticut.

16. Termination or Change of Insurance:

A. The Contractor shall notify the Department of any cancelation of insurance carrier or change to the required insurance coverage by submitting a new insurance certificate to the Department immediately following said cancelation or change in required coverage.

B. It is the responsibility of the Contractor to maintain evidence of a current insurance coverage with the Department for the duration of contract. It is the responsibility of the Contractor to file with the Department all renewals and new certificates of insurance issued due to changes in policy terms or changes in insurance carriers prior to the expiration dates on the forms already on file with the Department.

17. Duration of Coverage. The Contractor shall keep all the required insurance in continuous effect until the date that the Department designates for the termination of the Contractor's responsibility, as defined by Article 1.08.14.

18. Compensation: There shall be no direct compensation allowed the Contractor on account of any premium or other charge necessary to obtain and keep in effect any insurance or bonds in connection with the Project, but the cost thereof shall be considered included in the general cost of the Project work.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.05
CONTROL OF THE WORK**

In the list of Articles, replace
“1.05.02—Plans, Working Drawings and Shop Drawings” with “1.05.02—Plans, Working Drawings, Shop Drawings, Product Data, Submittal Preparation and Processing, and Designers Action”
and
“1.05.08—Vacant” with “1.05.08—Schedules and Reports”

In the list of Articles, after 1.05.16—Dimensions and Measurements add “1.05.17—Welding”

1.05.02—Plans, Working Drawings and Shop Drawings

Delete the entire Article and replace with the following:

1.05.02—Plans, Working Drawings, Shop Drawings, Product Data, Submittal Preparation and Processing, and Designers Action:

1. Plans: The plans prepared by the Department show the details necessary to give a comprehensive idea of the construction contemplated under the Contract. The plans will generally show location, character, dimensions, and details necessary to complete the Project. If the plans do not show complete details, they will show the necessary dimensions and details, which when used along with the other Contract documents, will enable the Contractor to prepare working drawings, shop drawings or product data necessary to complete the Project.

2. Working Drawings: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and submit six printed copies and one electronic copy in a pdf file format of the working drawings, signed, sealed and dated by a qualified Professional Engineer licensed to practice in the State of Connecticut, for review. The drawings shall be submitted to the Assistant District Engineer sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods specified in Subarticle 1.05.02-5 (including any necessary revisions, resubmittal, and final review).

There will be no direct payment for furnishing any working drawings, procedures or supporting calculations, but the cost thereof shall be considered as included in the general cost of the work.

- a. Working Drawings for Permanent Construction: Drawings shall be submitted on 22 in x 34 in (559 mm x 864 mm) sheets with a border and title block similar to the Department standard. Calculations, procedures and other supporting data may be submitted in an 8-1/2 in x 11 in (216 mm x 279 mm) format.

The Contractor shall supply to the Assistant District Engineer a certificate of insurance in accordance with Article 1.03.07 at the time that the working drawings for the Project are submitted.

The Contractor's designer, who prepares the working drawings, shall secure and maintain at no direct cost to the State a Professional Liability Insurance Policy for errors and omissions in the minimum amount of \$2,000,000 per error or omission. The Contractor's designer may elect to obtain a policy containing a maximum \$250,000 deductible clause, but if the Contractor's designer should obtain a policy containing such a clause, they shall be liable to the extent of at least the deductible amount. The Contractor's designer shall obtain the appropriate and proper endorsement of its Professional Liability Policy to cover the indemnification clause in this Contract, as the same relates to negligent acts, errors or omissions in the Project work performed by them. The Contractor's designer shall continue this

liability insurance coverage for a period of (1) 3 years from the date of acceptance of the work by the Engineer, as evidenced by a State of Connecticut, Department of Transportation Form Number CON-500, entitled "Certificate of Acceptance of Work," issued to the Contractor; or (2) 3 years after the termination of the Contract, whichever is earlier, subject to the continued commercial availability of such insurance.

- b. Working Drawings for Temporary Construction: The Contractor shall submit drawings, calculations, procedures and other supporting data in a format acceptable to the Assistant District Engineer.

3. Shop Drawings: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and submit six printed copies and one electronic copy in a pdf file format of the shop drawings to the Designer for review. Review timeframes and submission locations are specified in Subarticle 1.05.02-5.

Drawings shall be submitted on 22 in x 34 in (559 mm x 864 mm) sheets with an appropriate border and with a title block in the lower right-hand corner of each sheet. Procedures and other supporting data may be submitted on 8½ in x 11 in (216 mm x 279 mm) sheets.

There will be no direct payment for furnishing any shop drawings, but the cost thereof shall be considered as included in the general cost of the work.

4. Product Data: When required by the Contract, or when ordered to do so by the Engineer, the Contractor shall prepare and submit six printed copies and one electronic copy in a pdf file format of the product data.

The product data shall be submitted to the Designer for review, sufficiently in advance of the work detailed, to allow for their review in accordance with the review periods specified in Subarticle 1.05.02-5 (including any necessary revisions, resubmittal, and final review), and acquisition of materials, without causing a delay of the Project.

The Contractor shall submit the product data in a single submittal for each element of construction.

The Contractor shall mark each copy of the product data submittal to show applicable choices and options. Where product data includes information on several products that are not required, copies shall be marked to indicate the applicable information. Product data shall include the following information and confirmation of conformance with the Contract to the extent applicable: manufacturer's printed recommendations, compliance with recognized trade association standards, compliance with recognized testing agency standards, application of testing agency labels and seals, notation of coordination requirements, Contract item number, and any other information required by the individual Contract provisions.

There will be no direct payment for furnishing any product data, but the cost thereof shall be considered as included in the general cost of the work.

5. Submittal Preparation and Processing – Review Timeframes: The Contractor shall allow 30 calendar days for submittal review by the Department, from the date of receipt of printed copies in the appropriate Designer or Engineer's office. For any submittals marked with "Revise and Resubmit" or "Rejected," the Department is allowed an additional 20 calendar days for review of any resubmissions.

An extension of Contract time will not be authorized due to the Contractor's failure to transmit submittals sufficiently in advance of the work to permit processing.

The furnishing of shop drawings, working drawings or product data, any comments or suggestions by the Designer or Engineer concerning shop drawings, working drawings or product data, shall not relieve the Contractor of any of its responsibility for claims by the State or by third parties, as per Article 1.07.10.

The furnishing of the shop drawings, working drawings and product data shall not serve to relieve the Contractor of any part of its responsibility for the safety or the successful completion of the Project construction.

Submissions: Unless otherwise defined in the Contract, the Contractor shall transmit the working drawings, shop drawings and product data as follows:

- (a) Working drawings for permanent construction, shop drawings, and product data shall be submitted to the Designer. A copy of the transmittal or cover letter shall be forwarded to the Assistant District Engineer of the administering Construction District.

- (b) Working drawings for temporary construction shall be submitted to the Assistant District Engineer of the administering Construction District.
- (c) If not provided in the Contract, the Contractor shall request a list detailing the delivery location and contact person for each type of submittal, from the administering Construction District.

6. Designers Action: The Designer or Engineer will review each submittal, mark each with a uniform, self-explanatory action stamp, and return the stamped submittal promptly to the Contractor. The Contractor shall not proceed with the part of the Project covered by the submittal until the submittal is marked “No Exceptions Noted” or “Exceptions as Noted” by the Designer or Engineer. The Contractor shall retain sole responsibility for compliance with all Contract requirements. The stamp will be marked as follows to indicate the action taken:

- (a) If submittals are marked “No Exceptions Noted,” the Designer or Engineer has not observed any statement or feature that appears to deviate from the Contract requirements. This disposition is contingent on being able to execute any manufacturer’s written warranty in compliance with the Contract provisions. The Contractor may proceed with the work covered in the submittal.
- (b) If submittals are marked “Exceptions as Noted” the considerations or changes noted by the Designer or Engineer are necessary in order for the submittal to comply with Contract requirements. The Contractor shall review the required changes and inform the Designer or Engineer if they feel the changes violate a provision of the Contract or would lessen the warranty coverage.
- (c) If submittals are marked “Revise and Resubmit,” the Contractor shall revise the submittals to address the deficiencies or provide additional information as noted by the Designer or Engineer. The Contractor shall allow an additional review period as specified in Subarticle 1.05.02-5.
- (d) If submittals are marked “Rejected,” the Contractor shall prepare and submit a new submittal in accordance with the Designer’s or Engineer’s notations. The resubmissions require an additional review and determination by the Designer or Engineer. The Contractor shall allow an additional review period as specified in Subarticle 1.05.02-5.”

1.05.08–Vacant:

Replace with the following:

“1.05.08—SCHEDULES AND REPORTS:

When a project coordinator is not required by the Contract the following shall apply:

Baseline Bar Chart Construction Schedule: Within 20 calendar days after contract award the Contractor shall develop a comprehensive bar chart as a baseline schedule for the project. The bar chart schedule shall be submitted to the Engineer for approval and shall be based on the following guidelines:

1. The bar chart schedule shall contain a list of activities that represents the major activities of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The bar chart schedule shall contain sufficient detail to describe the progression of the work in a comprehensive manner. As a guide, 10 to 15 bar chart activities should be provided for each \$1 million of contract value.

The following list is provided as an example only and is not meant to be all-inclusive or all-applicable:

Project Constraints

-Winter shutdowns

- Environmental permits/application time of year restrictions
- Milestones
- Third Party approvals
- Long lead time items (procurement and fabrication of major elements)
- Adjacent Projects or work by others

Award

Notice to Proceed

Signing (Construction, temporary, permanent by location)

Mobilization

Permits as required

Field Office

Utility Relocations

Submittals/shop drawings/working drawings/product data

Construction of Waste Stock pile area

Clearing and Grubbing

Earthwork (Borrow, earth ex, rock ex etc.)

Traffic control items (including illumination and signalization)

Pavement markings

Roadway Construction (Breakdown into components)

Drainage (Breakdown into components)

Culverts

Plantings (including turf establishment)

Semi-final inspection

Final Cleanup

As required the following may supplement the activities listed above for the specific project types indicated:

- a. For bridges and other structures, include major components such as abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.

Temporary Earth Retention Systems

Cofferdam and Dewatering

Structure Excavation

Piles/test piles

Temporary Structures

Removal of Superstructure

Bearing Pads

Structural Steel (Breakdown by fabrication, delivery, installation, painting etc.)

Bridge deck

- b. Multiple location projects such as traffic signal, incident management, lighting, planting and guiderail projects will be broken down first by location and then by operation. Other major activities of these types of projects should include, but are not limited to:

Installation of anchors

Driving posts

Foundations

Trenching and Backfilling

Installation of Span poles/mast arms
Installation of luminaries
Installation of cameras
Installation of VMS
Hanging signal heads
Sawcut loops
Energizing equipment

c. Facility Projects – Facilities construction shall reflect the same breakdown of the Project as the Schedule of Values:

Division 2 – Existing Conditions
Division 3 – Concrete
Division 4 – Masonry
Division 5 – Metals
Division 6 – Wood, Plastic, and Composites
Division 7 – Thermal and Moisture Protection
Division 8 – Openings
Division 9 – Finishes
Division 10 – Specialties
Division 11 – Equipment
Division 12 - Furnishings
Division 13 – Special Construction
Division 14 – Conveying Equipment
Division 21 – Fire Suppression
Division 22 – Plumbing
Division 23 – Heating, Ventilating, and Air Conditioning
Division 26 – Electrical
Division 27 – Communications
Division 28 – Electronic Safety and Security
Division 31 – Earthwork
Division 32 – Exterior Improvements
Division 33 - Utilities

2. If the Engineer determines that additional detail is necessary, the Contractor shall provide it.

3. Each activity shall have a separate schedule bar. The schedule timeline shall be broken into weekly time periods with a vertical line to identify the first working day of each week.

4. The bar chart schedule shall show relationships among activities. The critical path for the Project shall be clearly defined on the schedule. The schedule shall show milestones for major elements of work, and shall be prepared on a sheet, or series of sheets of sufficient width to show data for the entire construction period.

5. If scheduling software is used to create the bar chart schedule, related reports such as a predecessor and successor report, a sort by total float, and a sort by early start shall also be submitted.

6. Project activities shall be scheduled to demonstrate that the construction completion date for the Project will occur prior to expiration of the Contract time. In addition, the schedule shall demonstrate conformance with any other dates stipulated in the Contract.

7. The Contractor is responsible to inform its subcontractor(s) and supplier(s) of the project schedule and any relevant updates.
8. There will be no direct payment for furnishing schedules, the cost thereof shall be considered as included in the general cost of the work.
9. For projects without a Mobilization item, 5% of the contract value will be withheld until such time as the Baseline Schedule is approved.

Monthly Updates: No later than the 10th day of each month, unless directed otherwise by the Engineer, the Contractor shall deliver to the Engineer three copies of the schedule to show the work actually accomplished during the preceding month, the actual time spent on each activity, and the estimated time needed to complete any activity which has been started but not completed. Each time bar shall indicate, in 10% increments, the estimated percentage of that activity which remains to be completed. As the Project progresses, the Contractor shall place a contrasting mark in each bar to indicate the actual percentage of the activity that has been completed.

The monthly update shall include revisions of the schedule necessitated by revisions to the Project directed by the Engineer (including, but not limited to extra work), during the month preceding the update. Similarly, any changes of the schedule required due to changes in the Contractor's planning or progress shall also be included. The Engineer reserves the right to reject any such revisions. If the schedule revisions extend the contract completion date, due to extra or added work or delays beyond the control of the Contractor, the Contractor shall submit a request in writing for an extension of time in accordance with Article 1.08.08. This request shall be supported by an analysis of the schedules submitted previously.

Any schedule revisions shall be identified and explained in a cover letter accompanying the monthly update. The letter shall also describe in general terms the progress of the Project since the last schedule update and shall identify any items of special interest.

If the Contractor fails to provide monthly schedule updates, the Engineer has the right to hold 10% of the monthly estimated payment, or \$5,000, whichever is less, until such time as an update has been provided in accordance with this provision.

Biweekly Schedules: Each week, the Contractor shall submit to the Engineer a two week look-ahead schedule. This short-term schedule may be handwritten but shall clearly indicate all work planned for the following two week period.

Recovery Schedules: If the updated schedule indicates that the Project has fallen behind schedule, the Contractor shall either submit a time extension request in accordance with 1.08.08 or immediately institute steps acceptable to the Engineer to improve its progress of the Project. In such a case, the Contractor shall submit a recovery plan, as may be deemed necessary by the Engineer, to demonstrate the manner in which an acceptable rate of progress will be regained."

Article 1.05.12–Payrolls:

Replace the first paragraph with the following:

" For each week of the Project from the first week during which an employee of the Contractor does Project work to which prevailing wage requirements apply, until the last

week on which such an employee does such work, the Contractor shall furnish to the Engineer certified copies of payrolls showing:

- (a) the names of the employees who worked on the Project and whose work is subject to prevailing wage requirements,
- (b) the specific days and hours and numbers of hours that each such employee worked on the Project, and
- (c) the amount of money paid to each such employee for Project work.

Each such payroll shall include the statement(s) of compliance with prevailing wage laws required by the State of Connecticut and, if applicable, by the Federal government. Said payrolls must contain all information required by Connecticut General Statutes Section 31-53 (as it may be revised). For contracts subject to Federal prevailing wage requirements, each payroll shall also contain the information required by the Davis Bacon and Related Acts (DBR). All of the payroll requirements in this Article shall also apply to the work of any subcontractor or other party that performs work on the Project site, and the Contractor shall be responsible for ensuring that each such party meets said requirements.”

Article 1.05.15–Markings for Underground Facilities:

Replace the beginning of the first sentence with the following:

“In conformance with Sections 16-345 through 16-359 of the Regulations of the PURA state statutes, the Contractor is responsible for notifying ‘Call Before You Dig’ ...”

After Article 1.05.16–Dimensions and Measurements, add the following article:

“1.05.17 - WELDING

The Contractor shall ensure that all welding of materials permanently incorporated into the work, and welding of materials used temporarily during construction of the work is performed in accordance with the following codes:

- American Welding Society (AWS) Structural Welding Code – Steel – ANSI/AWS D1.1: Miscellaneous steel items that are statically loaded including but not limited to columns, and floor beams in buildings, railings, sign supports, cofferdams, tubular items, and modifications to existing statically loaded structures.
- AWS Structural Welding Code – Aluminum – AWS D1.2/D1.2M: Any aluminum structure or member including but not limited to brackets, light standards, and poles.
- AWS Structural Welding Code – Sheet Steel – AWS D1.3/D1.3M: Sheet steel and cold-formed members 0.18 in.(4.6 mm) or less in thickness used as, but not limited, to decking and stay-in-place forms.
- AWS Structural Welding Code – Reinforcing Steel – AWS D1.4/D1.4M: Steel material used in the reinforcement of cast-in-place or pre-cast Portland cement concrete elements including but not limited to bridge decks, catch basin components, walls, beams, deck units, and girders.

- AASHTO/AWS – Bridge Welding Code, AASHTO/AWS D1.5/D1.5M: Steel highway bridges and other dynamically loaded steel structures. Also includes sign supports, and any other fracture critical structure.

The edition governing the work shall be in effect on the date the Contract was advertised for solicitation of bids.

The Contractor is responsible to provide a Certified Welding Inspector in accordance with the above noted codes. The cost for this service is included in the general cost of the work.

All welders shall be certified by the Engineer in accordance with Section 6.03.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.07
LEGAL RELATIONS AND RESPONSIBILITIES**

In the list of Articles, change “1.07.07 – Public Convenience and Safety” to “1.07.07 – Safety and Public Convenience.”

1.07.05 – Load Restrictions

Delete the entire article and replace with the following:

“1.07.05 – Load Restrictions

(a) Vehicle Weights: This subarticle will apply to travel both on existing pavements and pavements under construction. The Contractor shall comply with all legal load restrictions as to vehicle size, the gross weight of vehicles, and the axle weight of vehicles while hauling materials. Throughout the duration of the contract, the Contractor shall take precautions to ensure existing and newly installed roadway structures and appurtenances are not damaged by construction vehicles or operations.

Unless otherwise noted in contract specifications or plans, on and off road equipment of the Contractor, either loaded or unloaded, will not be allowed to travel across any bridge or on any highway when such a vehicle exceeds the statutory limit or posted limit of such bridge or highway. Should such movement of equipment become necessary the Contractor shall apply for a permit from the Department for such travel, as provided in the Connecticut General Statutes (CGS). The movement of any such vehicles within the project limits or detour routes shall be submitted to the Engineer for project record. Such permit or submittal will not excuse the Contractor from liability for damage to the highway caused by its equipment.

The Contractor is subject to fines, assessments and other penalties that may be levied as a result of violations by its employees or agents of the legal restrictions as to vehicle size and weight.

(b) Storage of Construction Materials/Equipment on Structures: Storage is determined to be non-operating equipment or material. The Contractor shall not exceed the statutory limit or posted limit for either an existing or new structure when storing materials and/or construction equipment. When a structure is not posted, then the maximum weight of equipment or materials stored in each 12 foot wide travel lane of any given span shall be limited to 750 pounds per linear foot combined with a 20,000 pound concentrated load located anywhere within the subject lane. If anticipated storage of equipment or material exceeds the above provision, then the Contractor shall submit his proposal of storage supported by calculations stamped by a Professional Engineer registered in the State of Connecticut, to the Engineer for approval 14 days prior to the storage operation. Operations related to structural steel demolition or erection shall follow the guidelines under Section 6.03. All other submittals shall include a detailed description of the material/equipment to be stored, the quantity of storage if it is stockpiled materials, the storage location, gross weight with supporting calculations if applicable, anticipated duration of storage and any environmental safety, or traffic protection that may be required. Storage location on the structure shall be clearly defined in the field. If structures are in a state of staged construction or demolition, additional structural analysis may be required prior to authorization of storage.”

1.07.07 – Safety and Public Convenience

*Change the title of Article 1.07.07 to read “**1.07.07 – Safety and Public Convenience**” and change the last sentence of the seventh paragraph to read as follows:*

“The Contractor must make available for reference in its field office, throughout the duration of the Project, a copy of the Safety Plan and the latest edition, including all supplements, of the CFR pertaining to OSHA.”

After the ninth paragraph insert the following:

“ Before beginning work on the Project, the Contractor shall have a Safety Plan on file with the Department. The Safety Plan shall include the policies and procedures necessary for the Contractor to comply with OSHA and other pertinent regulatory rules, regulations and guidelines. The Safety Plan may be a comprehensive company-wide plan provided it addresses the scope and type of work contemplated by the Contract. The Safety Plan shall address all the requirements of this Section and any applicable State or Federal regulations, and shall be revised and updated as necessary.

The following elements shall be included in the Safety Plan:

1. General introduction describing the scope and applicability of the Safety Plan.
2. Identification of key staff responsible for the implementation and monitoring of the Contractor’s Safety Plan, and their roles and responsibilities for safety.
3. Training requirements relative to safety.
4. Safety rules and checklists specific to the types of work generally performed by the Contractor.
5. Record-keeping and reporting requirements.
6. Identification of special hazards related to specific work elements.

The Contractor is responsible for the Safety Plan. Pursuant to Article 1.07.10, the Contractor shall indemnify, and save harmless the State from any and all liability related to any violation of the Safety Plan.”

1.07.18 – Use of State Property

After Subarticle (h) add the following sentence:

“Gore areas are not available for disposal of surplus material.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.08
PROSECUTION AND PROGRESS**

1.08.01 – Transfer of Work or Contract:

Replace the last paragraph with the following paragraphs:

“ The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of its right, title, or interest therein, to any individual or entity without the written consent of the Commissioner. No payment will be made for such work until written consent is provided by the Commissioner.

The Contractor shall pay the subcontractor for work performed within thirty (30) days after the Contractor receives payment for the work performed by the subcontractor. Withholding retainage by the Contractor, subcontractor or lower tier subcontractors is not allowed.

Payment for work that has been performed by a subcontractor does not eliminate the Contractor’s responsibilities for all the work as defined in Article 1.07.12, “Contractor’s Responsibility for Work.”

Payment for work that has been performed by a subcontractor also does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor’s items of work. Failure of a subcontractor to meet its maintenance, warranty or defective work responsibilities may result in administrative action on future Department contracts.

For any dispute regarding prompt payment, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.

Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is nonresponsive as a bidder for a Department contract.”

1.08.07 – Determination of Contract Time:

Replace the first paragraph with the following:

“ Unless the Contract requires the Project completion by a specified date, the number of calendar days allowed for the completion of the Project will be fixed by the Department, will be stated in the Contract, and will be known (with any subsequent adjustments) as the "Contract time." If at any time the Contractor submits a schedule showing completion of the work more than 30 calendar days in advance of the Contract completion date, the Department will issue a no-cost construction order revising the allowable Contract time to that shown on the Contractor's schedule.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.09
MEASUREMENT AND PAYMENT**

1.09.04 – Extra and Cost-Plus Work

Delete the word “bonding” under section (a) Labor, (3).

Delete existing subarticle (e) and replace with the following:

“(e) Administrative Expense: When extra work on a cost-plus basis is performed by an authorized subcontractor, the Department will pay the Contractor an additional 7.5% for that work; such payment will be in addition to the percentage payments described in (a), (b), (c) and (d) above, as a reimbursement for the Contractor's administrative expense in connection with such work. Approval of such additional payments will be given only after the Contractor provides to the Engineer receipted invoices for all relevant costs.”

1.09.06 – Partial Payments:

In the first paragraph under A. Monthly and Semi-monthly Estimates:, delete the second, third and fourth sentences and replace the remainder of subarticle (1) with the following:

“Retainage will not be held.

Exceptions may be made as follows:

- (a) When not in conflict with the interests of the State, the Contractor may request, and the Engineer may make, semi-monthly estimates for payment.
- (b) If, in the judgment of the Assistant District Engineer, the Project is not proceeding in accordance with the Contract the Engineer may decline to make a payment estimate.
- (c) If the total value of the Project work complete since the last estimate amounts to less than \$2,500 the Engineer also may decline to make a payment estimate.”

Replace the first paragraph of subarticle B. Payment for Stored Materials: with the following:

“B. Payment for Stored Materials: Non-perishable materials that are required for Project construction and that the Contractor has produced or purchased specifically for incorporation into the Project, but which have not yet been so incorporated, may be included in a payment estimate if

- (i) the materials meet all applicable Contract specifications,
- (ii) the materials have been delivered to the Project site or to another location approved by the Engineer, and

(iii) the Contractor has submitted to the Engineer, as evidence of the Contractor's purchase of the materials, either a copy of a receipted bill for same or a Certificate of Title to the materials, in the form approved by the Department, duly-executed by the Contractor and Vendor.

The Engineer will decide at what fair and appropriate fraction of the applicable Contract price such materials may be included in a payment estimate."

1.09.07 – Final Payment:

Replace the entire article with the following:

"1.09.07 – Final Payment: When the Commissioner has accepted the Project in accordance with Article 1.08.14, the Engineer will prepare a final payment estimate."

Replace the fifth paragraph with the following:

“ The total elapsed time in calendar days, computed as described above, from the commencement date specified in the Engineer's "Notice to Proceed" to the “Substantial Completion” date specified in the Engineer's "Notice of Substantial Completion" shall be considered as the time used in the performance of the Contract work.”

1.08.09 – Failure to Complete Work on Time:

Replace the second paragraph with the following:

“ If the last day of the initial Contract time or the initial Contract date determined for Substantial Completion is before December 1 in the given year, liquidated damages as specified in the Contract shall be assessed against the Contractor per calendar day (including any days during a winter shutdown period) from that day until the date on which the Project is substantially completed.”

1.08.12—Final Inspection:

Replace the first paragraph with the following:

“ If the Engineer determines that the work may be substantially complete, a Semi Final Inspection will be held as soon as practical. After the Semi Final Inspection is held and the Engineer determines that the requirements for Substantial Completion have been satisfied the Engineer will prepare a “Notice of Substantial Completion”.

When the Contractor has completed all work listed in the “Notice of Substantial Completion” the Contractor shall prepare a written notice requesting a Final Inspection and a “Certificate of Acceptance of Work”. The Engineer will hold an Inspection of the Project as soon as practical after the Engineer determines that the Project may be completed. If the Engineer deems the Project complete, said inspection shall constitute the Final Inspection, and the Engineer will notify the Contractor in writing that the Final Inspection has been performed.”

1.08.13 – Acceptance of Work and Termination of the Contractor’s Responsibility:

Replace the only paragraph with the following:

“ The Contractor’s responsibility for non-administrative Project work will be considered terminated when the final inspection has been held, any required additional work and final cleaning-up have been completed, all final operation and maintenance manuals have been submitted, and all of the Contractor’s equipment and construction signs have been removed from the Project site. When these requirements have been met to the satisfaction of the Engineer, the Commissioner will accept the work by certifying in writing to the Contractor that the non-administrative Project work has been completed.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.10
ENVIRONMENTAL COMPLIANCE**

Add the following Article:

“1.10.08 – VEHICLE EMISSIONS

All motor vehicles and/or construction equipment (both on-highway and off-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.

The Contractor shall establish staging zones for vehicles that are waiting to load or unload at the contract area. Such zones shall be located where the emissions from the vehicles will have minimum impact on abutters and the general public.

Idling of delivery trucks, dump trucks, and other equipment shall not be permitted in excess of 3 minutes during periods of non-activity except as allowed by the Regulations of Connecticut State Agencies Section 22a-174-18(b)(3)(c):

No mobile source engine shall be allowed to operate for more than three (3) consecutive minutes when the mobile source is not in motion, except as follows:

- (i) When a mobile source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control,
- (ii) When it is necessary to operate defrosting, heating or cooling equipment to ensure the safety or health of the driver or passengers,
- (iii) When it is necessary to operate auxiliary equipment that is located in or on the mobile source to accomplish the intended use of the mobile source,
- (iv) To bring the mobile source to the manufacturer's recommended operating temperature,
- (v) When the outdoor temperature is below twenty degrees Fahrenheit (20 degrees F) [negative seven degrees Celsius (-7 degrees C)],
- (vi) When the mobile source is undergoing maintenance that requires such mobile source be operated for more than three (3) consecutive minutes, or
- (vii) When a mobile source is in queue to be inspected by U.S. military personnel prior to gaining access to a U.S. military installation.

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Sensitive receptors include but are not limited to hospitals, schools, daycare facilities, elderly housing and convalescent facilities. Engine exhaust shall be located away from fresh air intakes, air conditioners, and windows.

A Vehicle Emissions Mitigation plan will be required for areas where extensive work will be performed within (less than 50 feet (15 meters)) to sensitive receptors. No work will proceed until a sequence of construction and a Vehicle Emissions Mitigation plan is submitted in writing to the Engineer for review and all comments are addressed in a manner acceptable to the Engineer. The mitigation plan must address the control of vehicle emissions from all vehicles and construction equipment.

Any costs associated with this "Vehicle Emissions" article shall be included in the general cost of the Contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall not be grounds for claims as outlined in Section 1.11 – "Claims."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.11
CLAIMS**

Add the following Section:

**SECTION 1.11
CLAIMS**

1.11.01 – General

1.11.02 – Notice of Claim

1.11.03 – Record Keeping

1.11.04 – Claim Compensation

1.11.05 – Required Claim Documentation

1.11.06 – Auditing of Claims

1.11.01 – General: When filing a formal claim under Section 4-61 (referred to as “Section 4-61” below) of the C.G.S. (as revised), either as a lawsuit in the Superior Court or as a demand for arbitration, the Contractor must follow the procedures and comply with the requirements set forth in this Section of the Specifications. This Section does not, unless so specified, govern informal claims for additional compensation which the Contractor may bring before the Department. The Contractor should understand, however, that the Department may need, before the Department can resolve such a claim, the same kinds of documentation and other substantiation that it requires under this Section. It is the intent of the Department to compensate the Contractor for actual increased costs caused by or arising from acts or omissions on the part of the Department that violate legal or contractual duties owed to the Contractor by the Department.

1.11.02 – Notice of Claim: Whenever the Contractor intends to file a formal claim against the Department under Section 4-61, seeking compensation for additional costs, the Contractor shall notify the Commissioner in writing (in strict compliance with Section 4-61) of the details of said claim. Such written notice shall contain all pertinent information described in Article 1.11.05 below.

Once formal notice of a claim under C.G.S. Section 4-61 (b) (as revised) has been given to the Commissioner, the claimant may not change the claim in any way, in either concept or monetary amount, (1) without filing a new notice of claim and demand for arbitration to reflect any such change and (2) without the minimum period of six months after filing of the new demand commencing again and running before any hearing on the merits of the claim may be held. The only exception to this limitation will be for damages that continue to accrue after submission of the notice, in ways described and anticipated in the notice.

1.11.03 – Record Keeping: The Contractor shall keep daily records of all costs incurred in connection with its construction-related activities on behalf of the Department. These daily records shall identify each aspect of the Project affected by

matters related to any claim for additional compensation that the Contractor has filed, intends to file, or has reason to believe that it may file against the Department; the specific Project locations where Project work has been so affected; the number of people working on the affected aspects of the Project at the pertinent time(s); and the types and number of pieces of equipment on the Project site at the pertinent time(s). If possible, any potential or anticipated effect on the Project's progress or schedule which may result in a claim by the Contractor should also be noted contemporaneously with the cause of the effect, or as soon thereafter as possible.

1.11.04 – Claim Compensation: The payment of any claim, or any portion thereof, that is deemed valid by the Engineer shall be made in accordance with the following provisions of this Article:

(a) Compensable Items: The liability of the Department for claims will be limited to the following specifically-identified items of cost, insofar as they have not otherwise been paid for by the Department, and insofar as they were caused solely by the actions or omissions of the Department or its agents (except that with regard to payment for extra work, the Department will pay to the Contractor the mark-ups provided for in Article 1.04.05.):

- (1) Additional Project-site labor expenses.
- (2) Additional costs for materials.
- (3) Additional, unabsorbed Project-site overhead (**e.g.**, for mobilization and demobilization).
- (4) Additional costs for active equipment.
- (5) For each day of Project delay or suspension caused solely by actions or omissions of the Department, either
 - (i) an additional ten percent (10%) of the total amount of the costs identified in Subarticles (1) through (4) above; except that if the delay or suspension period prevented the Contractor from incurring enough Project costs under Subarticles (1) through (4) during that period to require a payment by the Department that would be greater than the payment described in subparagraph (ii) below, then the payment for affected home office overhead and profit shall instead be made in the following *per diem* amount:
 - (ii) six percent (6%) of the original total Contract amount divided by the original number of days of Contract time.

Payment under either (i) or (ii) hereof shall be deemed to be complete and mutually-satisfactory compensation for any unabsorbed home office overhead and any profit related to the period of delay or suspension.

- (6) Additional equipment costs. Only actual equipment costs shall be used in the calculation of any compensation to be made in response to claims for additional Project compensation. Actual equipment costs shall be based upon records kept in the normal course of business and in accordance with generally-accepted accounting principles. Under no circumstances shall Blue Book or other guide or rental rates be used for this purpose (unless the Contractor had to rent the equipment from an unrelated party, in which case the actual rental charges paid by the Contractor, so long as they are reasonable, shall be used). Idle equipment, for instance, shall be paid for based only on its actual cost to the Contractor.

- (7) Subcontractor costs limited to, and determined in accordance with, Subarticles (1), (2), (3), (4), and (5) above and applicable statutory and case law. Such subcontractor costs may be paid for by the Department only (a) in the context of an informal claims settlement or (b) if the Contractor has itself paid or legally-assumed, present unconditional liability for those subcontractor costs.

(b) Non-Compensable Items: The Department will have no liability for the following specifically-identified non-compensable items:

- (1) Profit, in excess of that provided for herein.
- (2) Loss of anticipated profit.
- (3) Loss of bidding opportunities.
- (4) Reduction of bidding capacity.
- (5) Home office overhead in excess of that provided for in Article 1.11.04(a)(5) hereof.
- (6) Attorneys fees, claims preparation expenses, or other costs of claims proceedings or resolution.
- (7) Any other consequential or indirect expenses or costs, such as tort damages, or any other form of expense or damages not provided for in these Specifications or elsewhere in the Contract.

1.11.05 – Required Claim Documentation: All claims shall be submitted in writing to the Commissioner, and shall be sufficient in detail to enable the Engineer to ascertain the basis and the amount of each claim, and to investigate and evaluate each claim in detail. As a minimum, the Contractor must provide the following information for each and every claim and sub-claim asserted:

- (a) A detailed factual statement of the claim, with all dates, locations and items of work pertinent to the claim.
- (b) A statement of whether each requested additional amount of compensation or extension of time is based on provisions of the Contract or on an alleged breach of the Contract. Each supporting or breached Contract provision and a statement of the reasons why each such provision supports the claim, must be specifically identified or explained.
- (c) Excerpts from manuals or other texts which are standard in the industry, if available, that support the Contractor's claim.
- (d) The details of the circumstances that gave rise to the claim.
- (e) The date(s) on which any and all events resulting in the claim occurred, and the date(s) on which conditions resulting in the claim first became evident to the Contractor.
- (f) Specific identification of any pertinent document, and detailed description of the substance of any material oral communication, relating to the substance of such claim.
- (g) If an extension of time is sought, the specific dates and number of days for which it is sought, and the basis or bases for the extension sought. A critical path method, bar chart, or other type of graphical schedule that supports the extension must be submitted.
- (h) When submitting any claim over \$50,000, the Contractor shall certify in writing, under oath and in accordance with the formalities required by the contract, as to the following:
 - (1) That supporting data is accurate and complete to the Contractors best

- knowledge and belief;
- (2) That the amount of the dispute and the dispute itself accurately reflects what the Contractor in good faith believes to be the Department's liability;
 - (3) The certification shall be executed by:
 - a. If the Contractor is an individual, the certification shall be executed by that individual.
 - b. If the Contractor is not an individual, the certification shall be executed by a senior company official in charge at the Contractor's plant or location involved or an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

1.11.06 – Auditing of Claims: All claims filed against the Department shall be subject to audit by the Department or its agents at any time following the filing of such claim. The Contractor and its subcontractors and suppliers shall cooperate fully with the Department's auditors. Failure of the Contractor, its subcontractors, or its suppliers to maintain and retain sufficient records to allow the Department or its agents to fully evaluate the claim shall constitute a waiver of any portion of such claim that cannot be verified by specific, adequate, contemporaneous records, and shall bar recovery on any claim or any portion of a claim for which such verification is not produced. Without limiting the foregoing requirements, and as a minimum, the Contractor shall make available to the Department and its agents the following documents in connection with any claim that the Contractor submits:

- (1) Daily time sheets and foreman's daily reports.
- (2) Union agreements, if any.
- (3) Insurance, welfare, and benefits records.
- (4) Payroll register.
- (5) Earnings records.
- (6) Payroll tax returns.
- (7) Records of property tax payments.
- (8) Material invoices, purchase orders, and all material and supply acquisition contracts.
- (9) Materials cost distribution worksheets.
- (10) Equipment records (list of company equipment, rates, etc.).
- (11) Vendor rental agreements
- (12) Subcontractor invoices to the Contractor, and the Contractor's certificates of payments to subcontractors.
- (13) Subcontractor payment certificates.
- (14) Canceled checks (payroll and vendors).
- (15) Job cost reports.
- (16) Job payroll ledger.
- (17) General ledger, general journal (if used), and all subsidiary ledgers and journals, together with all supporting documentation pertinent to entries made in these ledgers and journals.
- (18) Cash disbursements journals.
- (19) Financial statements for all years reflecting the operations on the Project.
- (20) Income tax returns for all years reflecting the operations on the Project.
- (21) Depreciation records on all company equipment, whether such records are maintained by the company involved, its accountant, or others.

- (22) If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all such other source documents.
- (23) All documents which reflect the Contractor's actual profit and overhead during the years that the Project was being performed, and for each of the five years prior to the commencement of the Project.
- (24) All documents related to the preparation of the Contractor's bid, including the final calculations on which the bid was based.
- (25) All documents which relate to the claim or to any sub-claim, together with all documents that support the amount of damages as to each claim or sub-claim.
- (26) Worksheets used to prepare the claim, which indicate the cost components of each item of the claim, including but not limited to the pertinent costs of labor, benefits and insurance, materials, equipment, and subcontractors' damages, as well as all documents which establish the relevant time periods, individuals involved, and the Project hours and the rates for the individuals.
- (27) The name, function, and pertinent activity of each Contractor's or subcontractor's official, or employee involved in or knowledgeable about events that give rise to, or facts that relate to, the claim.
- (28) The amount(s) of additional compensation sought and a break-down of the amount(s) into the categories specified as payable under Article 1.11.04 above.
- (29) The name, function, and pertinent activity of each Department official, employee or agent involved in or knowledgeable about events that give rise to, or facts that relate to, the claim.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 1.20
GENERAL CLAUSES FOR FACILITIES CONSTRUCTION**

1.20-1.00 – General:

Delete the last sentence of the first paragraph and replace with the following:

“Facilities Construction is defined as the type of construction that requires the issuance of a Certificate of Compliance (C.O.C.) by the State Building Inspector or his authorized representative at the completion of a project, and includes site work considered ancillary to this type of construction.”

Add the following article:

“1.20-1.01.01—Definitions:

OWNER: Where used herein, it is synonymous with Department or State.”

1.20-1.02.04 – Examination of Plans, Specifications, Special Provisions and Site of Work:

Delete the first sentence of the first paragraph and replace with the following:

“CSI-formatted specifications are organized into Divisions and Sections based on the CSI’s “MasterFormat” numbering system.”

1.20-1.02.13 – Knowledge of Applicable Laws:

Delete Items 1 through 9 in their entirety and replace with the following:

1. “The 2003 International Building Code with the State Building Code, including latest Connecticut Supplement and Amendments.
2. The 2003 International Plumbing Code.
3. The 2003 International Mechanical Code.
4. The 2003 International Existing Building Code.
5. The 2009 International Energy Conservation Code.
6. The 2011 NFPA 70 National Electrical Code.
7. The 2003 ICC/ANSI A117.1.
8. The Fire Safety Code, including latest Connecticut Supplement and Amendments.
9. The 2003 International Fire Code.
10. The 2003 NFPA 1 Uniform Fire Code.

11. The 2003 NFPA 101 Life Safety Code.”

Add the following as the new last paragraph:

“All work to be performed by the Contractor shall comply with the “Americans with Disabilities Act Accessibility Guidelines.””

1.20-1.03.01 – Consideration of Bids:

Delete the entire article and replace with the following:

“The apparent low bidder shall submit to the Manager of Contracts a Schedule of Values within 14 days after bid opening. Any other Contractor that the Department may subsequently designate as the apparent lowest bidder shall make the aforesaid submission within 14 days from the date on which the Department notifies said Contractor that it has become the apparent lowest bidder. If, however, the Department deems it necessary for such a subsequently designated Contractor to make said submission within a shorter period of time, the Contractor shall make the submission within the time designated by the Department.

The total in the Schedule of Values shall equal the bid dollar amount for the Major Lump Sum Item (MLSI).

The Schedule of Values shall be divided into “Line Items” listed separately for each CSI Section of the Special Provisions. An additional line item for “Mobilization” shall be incorporated into the Schedule of Values; however, this item may not exceed 7.5% of the value of the MLSI. The “Mobilization” line item will also include costs associated with “General Conditions” and “Insurance/Bonding.” An additional line item for “Project Closeout” shall be incorporated into the Schedule of Values; however, this item must be at least 2.5% of the value of the MLSI. Where requested by the Department, the Contractor shall break down the line items further into more specific line items.

In the event that this Contract is terminated or a portion of this Contract is deleted for any reason or in any way allowable by law under this Contract after the apparent low bidder has been awarded the Contract, the Schedule of Values will not be used for estimating payment due the Contractor for work completed prior to such termination of the Contract or deletion of work thereunder. In the case of Contract termination, payment shall be made in accordance with Article 1.05.14.”

1.20-1.05.02--Shop Drawings, Product Data, Product Samples and Quality Assurance Submittals:

Delete the last sentence of the first paragraph and replace with the following:

“All facsimiles or other electronic documents from the Contractor shall be followed by an

official transmittal.”

Delete the third paragraph and replace with the following:

“The Contractor shall number each submittal consecutively: When resubmitting a “Revise and Resubmit” or “Rejected” submittal, the Contractor shall label the transmittal with the original submittal number followed by a letter to designate the additional submission. All submittals shall be numbered conforming to the following examples:”

In column B of line 001, line 001a, and line 001b of the table in subsection 1, replace “07511” with “075110.”

Add the following to the end of the first paragraph of subsection 2:

“The Department reserves the right to return partial submittals unreviewed to the Contractor.”

Revise the third paragraph of subsection 2 to read:

“The Contractor shall allow at least 60 calendar days for review of any submittal requiring approval by FAA, FTA, any railroad, DEEP, U.S. Coast Guard, Army Corps of Engineers, or any other outside agency.”

Delete the third and fourth paragraphs of subsection 3 and replace with the following:

“The Designer will not review submittals and the Engineer will not process payment estimates until the initial submittal schedule has been provided. Any delays in construction due to the Contractor's failure to provide a submittal schedule shall be the responsibility of the Contractor.

The Contractor must update its submittal schedule at least once a month, and distribute and post each updated schedule in the manner described above. The Engineer reserves the right not to process payment estimates without a recently updated submittal schedule on file.”

Replace the first sentence of the first paragraph of subsection 4 with the following:

“Shop Drawings consist of fabrication and installation drawings, roughing-in and setting drawings, schedules, patterns, templates and similar drawings, and wiring diagrams showing field-installed wiring, including power, signal, and control wiring.”

Replace the second paragraph of subsection 4 with the following:

“Shop drawings shall include the following information: Contract number, Project

description, number and title of the drawing, date of drawing, revision number, name of Contractor and subcontractor submitting drawings, dimensions, identification of products, shopwork manufacturing instructions, design calculations, statement of compliance with Contractual standards, notation of dimensions established by field measurement, relationship to adjoining construction clearly indicated, seal and signature of a professional engineer if specified, and any other information required by individual Contract provisions.”

Replace the first sentence of the first paragraph of subsection 5 with the following:

“Product data consist of printed information such as manufacturer’s product specifications, manufacturer’s installation instructions, manufacturer’s catalog cuts, standard color charts, wiring diagrams showing factory-installed wiring, printed performance curves, operational range diagrams, and mill reports.”

Replace the first sentence of the first paragraph of subsection 7 with the following:

“Quality assurance submittals consist of qualification data, design data, certifications, manufacturer’s instructions, manufacturer’s field reports, test reports, Material Safety Data Sheets (MSDSs), and other quality assurance information required by individual Contract provisions.”

1.20-1.05.04—Coordination of Special Provisions, Plans, Supplemental Specifications and Standard Specifications and Other Contract Requirements:

Delete the first and second paragraphs and replace with the following:

“Industry Standards: Each entity engaged in construction of the Contract shall be familiar with industry standards applicable to that entity’s construction activities. If printed standards have been established by organizations referenced in Article 1.01.02 or in the Contract, the Contractor shall obtain copies of said standards directly from the publication source.

Unless the Special Provisions include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Special Provisions to the extent referenced. Such standards are made a part of the Contract by reference.”

Add the following article:

1.20-1.05.08—Schedules and Reports:

Daily Construction Reports: The Contractor shall assist the Engineer in the preparation of a daily construction report, by ensuring that each of the Contractor’s

employees and subcontractors working on the Project site on a given day signs the Engineer's sign-in sheet for that day; and by keeping and providing to the Engineer its own daily list of employees and subcontractors who worked on the Project site on that day.

Add the following article:

1.20-1.05.23—Requests for Information (RFIs):

The Contractor shall forward all RFIs to the Engineer in writing (facsimile or other electronic document) for review. The Engineer will forward the RFI to the Designer for review. Upon receipt of an RFI, the Designer will attempt to determine if additional information is required from the Contractor to respond to the RFI, and request said information from the Engineer.

All other RFIs will be responded to within 10 calendar days of receipt by the Designer.

1.20-1.05.24—Project Meetings:

Delete the third paragraph under subsection 1.

Delete the second paragraph under subsection 2 and replace with the following:

"The meeting participants shall review progress of other construction activities and preparations for the particular activity under consideration, including requirements of Contract documents, related requests for interpretations, related construction orders, purchases, deliveries, submittals, review of mockups, possible conflicts, compatibility problems, time schedules, weather limitations, manufacturer's written recommendations, warranty requirements, compatibility of materials, acceptability of substrates, temporary facilities and controls, space and access limitations, regulations of authorities having jurisdiction, testing and inspecting requirements, installation procedures coordination with other work, required performance results, protection of adjacent work, and protection of construction and personnel."

Delete the second, third and fourth paragraph under subsection 3 and replace with the following:

"The Contractor shall provide the Engineer with a detailed agenda for the proposed meeting, specifying what topics will be covered. In addition to representatives of the Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall attend these meetings. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Project.

At each progress meeting, the participants shall (1) review items of significance that could affect progress; (2) discuss topics appropriate to the current status of the Project;

(3) review progress since the last meeting; (4) determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's Construction Schedule; (5) determine how to expedite any Project work that may be behind schedule; (6) discuss whether or not schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract time; and (7) review the present and future needs of each entity represented at the meeting, including such items as interface requirements, time, sequences, deliveries, off-site fabrication problems, access, site utilization, temporary facilities and controls, hours of work, hazards and risks, housekeeping, quality and work standards, status of correction of deficient items, field observations, requests for interpretations, status of proposal requests, pending changes, status of construction orders, and documentation of information for payment requests. The Engineer will distribute copies of minutes of the meeting to the Designer and the Contractor. The Contractor shall distribute copies to parties who were or should have been at the meeting."

Delete article 1.20-1.05.25—Schedules and Reports in its entirety

1.20-1.06.08—Warranties:

Delete the eighth and ninth paragraph and replace with the following:

"The Contractor shall:

(a) Bind warranties in heavy-duty, commercial-quality, durable 3-ring vinyl-covered loose-leaf binders, thick enough to accommodate the contents, and sized to receive 8 1/2-inch x 11-inch paper (216-millimeter x 279-millimeter) paper.

(b) Identify the binder's contents on the binder's front and spine with the typed or printed title "WARRANTIES," the Project title or name, and the name of the Contractor.

(c) Provide a heavy paper divider with a tab for each separate warranty.

(d) Mark the tab to identify the related product or installation.

(e) Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the Contractor or pertinent subcontractor.

(f) Furnish to the Department a written warranty for all Project work accompanied by a cover letter with the following contents:

[Addressed to:]

Commissioner of Transportation
Department of Transportation
P.O. Box 317546
Newington, Connecticut 06131-7546

Project Title and Number

[We] hereby warrant all materials and workmanship for all work performed under this Contract for a period of one (1) year from [date of issuance of C.O.C.] against failures of

workmanship and materials in accordance with the Contract. Furthermore, as a condition of this warranty, [we] agree to have in place all insurance coverage identified in the Contract for the performance of any warranty work.

[Signature:] [Name of authorized signatory]
[Title]

(g) Submit to the Engineer, upon completion of installation of materials or assemblies that are required to have either a flame-rating or a fire-endurance hourly rating, a detailed letter certifying that the required rating has been attained.

Upon determination by the Engineer that Project work covered by a warranty has failed, the Contractor shall replace or rebuild the work to an acceptable condition complying with Contract requirements. The Contractor is responsible for the cost of replacing or rebuilding defective construction or components and those which may have needed to be damaged or removed in order to cure the defective work including costs of material, equipment, labor, and material disposal, regardless of whether or not the State has benefited from use of the work through a portion of its anticipated useful service life. The Contractor shall respond to the Project Site when Project work covered by a warranty has failed within 3 calendar days, unless in the Engineer's opinion said failure is deemed to be an emergency, in which case the Contractor shall respond to the Project Site as directed by the Engineer."

1.20-1.08.03—Prosecution of Work:

Under subsection '3. Cutting and Patching,' delete the heading 'B. Protection of Structural Elements' and replace with the following:

"B. Protection:"

Move the existing first and second paragraphs to under the following subparagraph:

"1. Structural Elements:"

Add the following after the first paragraph under B:

"2. Operational Elements: The Contractor shall not cut and patch operating elements and related components in a manner that results in their reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Miscellaneous Elements: The Contractor shall not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety."

Add the following after subsection 3:

“4. Selective Demolition:

A. Definitions:

Remove: The Contractor shall detach materials from existing construction and legally dispose or recycle them off-site, unless indicated to be removed and salvaged or removed and reinstalled. Except for materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Engineer's property, demolished materials shall become Contractor's property and shall be removed from the Project Site.

Remove and Salvage: The Contractor shall detach materials from existing construction and deliver them to Engineer. The Engineer reserves the right to identify other materials for salvage during the course of demolition.

Remove and Reinstall: The Contractor shall detach materials from existing construction, prepare them for reuse, and reinstall them where indicated.

Existing to Remain: Existing materials of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. Approval Process:

The Contractor shall submit pre-demolition photographs to the Engineer prior to the commencement of Project work to show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations.

Well in advance of performing any selective demolition on the Project, the Contractor shall submit to the Engineer a proposal describing the procedures that the Contractor intends to use for same.

The Contractor shall include the following information, as applicable, in its proposal: (1) detailed sequence of selective demolition and removal work with starting and ending dates for each activity while ensuring that the Engineer's on-site operations are not disrupted; (2) interruption of utility services; (3) coordination for shutoff, capping, and continuation of utility services; (4) use of elevators and stairs; (5) locations of temporary partitions and means of egress; (6) coordination of Engineer's continuing occupancy of portions of existing building and of Engineer's partial occupancy of completed Project work; and (7) means of protection for items to remain and items in path of waste removal from building.

The Contractor shall comply with (1) governing EPA notification regulations before beginning selective demolition; (2) hauling and disposal regulations of authorities having jurisdiction; (3) ANSI A10.6; and (4) NFPA 241.

The Engineer will conduct a Pre-Demolition Meeting at the Project site in accordance with Article 1.20-1.05.24. Said meeting will review the methods and procedures related to selective demolition including, but not limited to, the following: (1) an inspection and discussion of the condition of construction to be selectively demolished; (2) a review of the structural load limitations of the existing structure; (3) a review and finalization of the selective demolition schedule and a verification of the availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays; (4) a review of requirements of Project work performed by other trades that rely on substrates exposed by selective demolition operations; and (5) a review of areas where existing construction is to remain and requires protection.

C. Repair Materials:

The Contractor shall comply with Article 1.20-1.08.03 subsection 3E for repair materials and shall comply with material and installation requirements specified in other Contract provisions.

D. Examination:

The Contractor shall (1) verify that utilities have been disconnected and capped; (2) survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required; (3) inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged; (4) investigate and measure the nature and extent of unanticipated mechanical, electrical, or structural elements that conflict with intended function or design and submit a written report to Engineer; and (5) perform surveys as the Project work progresses to detect hazards resulting from selective demolition activities.

E. Utility Services:

The Contractor shall (1) maintain existing utility services indicated to remain and protect them against damage during selective demolition operations; (2) not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by the Engineer; (3) provide temporary services during interruptions to existing utilities, as acceptable to Engineer; (4) provide at least 3 calendar days' notice to the Engineer if shutdown of service is required during changeover; and (5) locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished. The Contractor shall arrange to shut off indicated utilities with utility companies. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition the Contractor shall provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.

The Contractor shall cut off pipe or conduit in walls or partitions to be removed and shall cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

The Contractor shall refer to other Contract provisions for shutting off, disconnecting, removing, and sealing or capping utilities. The Contractor shall not start selective demolition work until utility disconnecting and sealing have been completed and verified by the Engineer in writing.

F. Preparation:

The Contractor shall conduct selective demolition and debris-removal operations to ensure minimum interference with adjacent occupied and used facilities on the Project site. The Contractor shall not disrupt the Owner's operations without the Engineer's permission. The Contractor shall protect existing site improvements, appurtenances, and landscaping to remain.

The Contractor shall provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain. The Contractor shall provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas. The Contractor shall protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations. The Contractor shall cover and protect furniture, furnishings, and equipment that have not been removed.

The Contractor shall provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. The Contractor shall provide temporary weathertight enclosure for building exterior. Where heating is needed and permanent enclosure is not complete, the Contractor shall provide insulated temporary enclosures and shall coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

The Contractor shall erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

The Contractor shall provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished. The Contractor shall strengthen or add new supports when required during progress of selective demolition.

G. Pollution Controls:

The Contractor shall comply with governing regulations pertaining to environmental protection.

The Contractor shall not use water when it may create a hazardous or objectionable condition such as ice, flooding, or pollution.

The Contractor shall remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. The Contractor shall remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

The Contractor shall clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. The Contractor shall return adjacent areas to condition existing before selective demolition operations began.

H. Performance:

The Contractor shall not use explosives for demolition purposes.

The Contractor shall demolish and remove existing construction only to the extent required by new construction and as indicated. The Contractor shall (1) proceed with selective demolition systematically; (2) neatly cut openings and holes plumb, square, and true to dimensions required; (3) use cutting methods least likely to damage remaining or adjoining construction; (4) use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces; (5) temporarily cover openings to remain; (6) cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces; (7) not use cutting torches until work area is cleared of flammable materials; (8) verify condition and contents of concealed spaces such as duct and pipe interiors before starting flame-cutting operations; (9) maintain fire watch and portable fire-suppression devices during flame-cutting operations; (10) maintain adequate ventilation when using cutting torches; (11) remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site; (12) remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation; (13) locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing; and (14) dispose of demolished items and materials promptly.

The Contractor shall comply with the Engineer's requirements for using and protecting walkways, building entries, and other building facilities during selective demolition operations.

The Contractor shall demolish and remove foundations and other below-grade structures completely unless otherwise indicated on the plans. The Contractor shall fill below-grade areas and voids resulting from demolition of structures with granular fill materials. Prior to placement of fill materials, the Contractor shall ensure that the areas

to be filled are free of standing water, frost, frozen material, trash, and debris. After fill placement and compaction, grade surface to meet adjacent contours and provide flow to surface drainage structures. Backfilling and grading related to demolition is included in the Major Lump Sum Item (MLSI) for the Project. There will be no separate payment for this backfilling and grading.

The Contractor shall (1) demolish concrete in sections; (2) cut concrete at junctures with construction to remain to the depth shown on the Contract plans and at regular intervals using power-driven saw; and (3) remove concrete between saw cuts.

The Contractor shall (1) demolish masonry in small sections; (2) cut masonry at junctures with construction to remain using power-driven saw; and (3) remove masonry between saw cuts.

The Contractor shall (1) saw-cut perimeter of concrete slabs-on-grade to be demolished as shown on the Contract plans; and (2) break up and remove concrete slabs-on-grade.

The Contractor shall (1) remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum; and (2) remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

The Contractor shall (1) only remove existing roofing in one day to the extent that it can be covered by new roofing; and (2) refer to other Contract provisions for new roofing requirements.

The Contractor shall remove air conditioning equipment without releasing refrigerants.

I. Reuse of Building Elements:

The Contractor shall not demolish building elements beyond what is indicated on the plans without the Engineer's approval.

J. Removed and Salvaged Materials:

Unless otherwise directed by the Engineer, the Contractor shall (1) store materials in a secure area until delivery to the owner; (2) transport materials to the owner's storage area off-site; and (3) protect materials from damage during transport and storage.

K. Removed and Reinstalled Materials:

Unless otherwise directed by the Engineer, the Contractor shall (1) clean and repair materials to functional condition adequate for intended reuse; (2) paint equipment to match the color of new equipment; (3) protect materials from damage during transport and storage; and (4) reinstall items in locations indicated complying with installation

requirements for new materials and equipment and providing connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

L. Existing Materials to Remain:

The Contractor shall protect construction indicated to remain against damage and soiling during selective demolition.

The Contractor shall drain piping and cap or plug piping with the same or a compatible piping material for piping to be abandoned in place.

The Contractor shall cap or plug ducts with the same or a compatible ductwork material for ducts to be abandoned in place.

The Contractor shall cut and remove concealed conduits and wiring to be abandoned in place 2-inches (50-mm) below the surface of the adjacent construction, cap the conduit end, and patch the surface to match the existing finish. The Contractor shall cut existing conduits installed in concrete slabs to be abandoned in place flush with the top of the slab and fill conduit end with a minimum of 4-inches (100-mm) of concrete.

M. Patching and Repairing:

The Contractor shall comply with Article 1.20-1.08.03 subsection 3H for patching and repairing damage to adjacent construction caused by selective demolition operations.

N. Disposal of Demolished Materials:

The Contractor shall (1) not allow demolished materials to accumulate or be sold on the Project Site; (2) not burn demolished materials on the Project Site; and (3) promptly and legally dispose or recycle demolished materials off the Project Site."

1.20-1.08.05—Personnel and Equipment:

Replace "FM with "FMG" in subsection (a)

Add the following article:

"1.20-1.08.12—Semi-Final and Final Inspections:

1. Semi-Final Inspection: Before requesting the Semi-Final Inspection, the Contractor shall show 100% completion for all Project work claimed as complete. The Contractor shall submit final test/adjust/balance records including the final air and water balance report. For all incomplete Project work, the Contractor shall prepare its own "Punch List" of the incomplete items and reasons the work is not complete. The Contractor shall submit final test/adjust/balance records including the final air and water balance report.

On receipt of a Contractor request for inspection, the Engineer will proceed with inspection or notify the Contractor of unfulfilled requirements. The Engineer will prepare a "Punch List" of unfilled, substandard, or incomplete items. During this inspection, the Contractor shall have all technicians necessary to demonstrate the complete operation of all systems on-site. Examples of such systems include, but are not limited to, the following: boiler, HVAC, fire alarm, and building automation. The Engineer will advise the Contractor of the construction that must be completed or corrected before the issuance of the C.O.C. Results of the completed inspection will form the basis of requirements for the Final Inspection. The Engineer reserves the right to issue the C.O.C. after the Semi-Final Inspection if there are no Building Code or Fire Code compliance issues or any major "Punch List" items.

2. Final Inspection: Before requesting Final Inspection for issuance of the C.O.C., the Contractor shall: (1) submit specific warranties, maintenance service agreements, final certifications and similar documents; (2) submit Record Drawings, Record Specifications, operations and maintenance manuals, final project photographs, property surveys, and similar final record information; (3) deliver spare parts; (4) make final changeover of permanent locks and deliver the keys to the Engineer; (5) complete start-up testing of systems; (6) train the owner's operation and maintenance personnel; (7) discontinue or change over and remove temporary facilities from the Project Site, along with construction tools, mock-ups, and similar elements; (8) complete final cleaning requirements, including touch-up painting; (9) touch-up and otherwise repair and restore marred exposed finishes to eliminate visual defects; (10) submit a certified copy of the Engineer's "Punch List" of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer; (11) submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Final Inspection, or when the Engineer took possession of and responsibility for corresponding elements of the Project work; and (12) install permanent electrical service. The Contractor shall install permanent electrical service prior to Semi-Final Inspection if requested by the Engineer, or if necessary for the Engineer or Contractor to perform testing of building and other related systems and equipment to certify acceptance and completion of Project work. The Contractor shall submit all outstanding items or unacceptable submissions from the Semi-Final Inspection, or other outstanding items required for submittal, prior to the Final Inspection.

On receipt of a Contractor request for inspection, the Engineer will proceed with inspection and notify the Contractor of unfulfilled requirements."

1.20-1.08.13—Termination of the Contractor's Responsibility:

Add subsection 3 as follows:

"3. Insurance Coverage: The Contractor shall have in place all insurance coverage identified in Article 1.03.07 for the performance of any warranty work."

1.20-1.08.14—Acceptance of Project:

Add the following to subsection 2 under the heading “Equipment and Systems Maintenance Manual:”

“(j) Copies of maintenance agreements with service agent name and telephone number.”

Add the following paragraph in subsection 3 after the second paragraph:

“The Contractor shall provide a syllabus prior to the training to ensure that the appropriate owner’s operation and maintenance personnel are in attendance.”

Delete the last paragraph and replace with the following:

“ The Contractor shall submit to the Engineer for approval, a qualified commercial videographer to videotape the training sessions. The videographer shall be a firm or an individual of established reputation that has been regularly engaged as a professional videographer for not less than 3 years.

The Contractor shall video record each training session and provide said video in DVD format to the Engineer for the owner’s future use.”

Add the following section:

“1.20-1.09.06—Partial Payments:

With each payment request under the MLSI, the Contractor shall submit AIA Form G702 (Application and Certificate of Payment) and Form G703 (Continuation Sheet). The Contractor is not required to obtain the Architect’s signature on Form G702. Once approved by the Engineer, the Forms G702 and G703 become the basis of payment under the MLSI.”

Add the following section:

“1.20-9.75.04—Method of Measurement:

Mobilization as defined in Article 1.20-1.03.01 will be paid in the manner described hereinafter; however, the determination of the total contract price earned shall not include the amount of mobilization earned during the period covered by the current monthly estimate – but shall include amounts previously earned and certified for payment:

1. When the first payment estimate is made, 25 percent of the “Mobilization” line item will be certified for payment.

2. When the Baseline Schedule, as specified under Section 1.05.08, is accepted, 50 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

3. When 10 percent of the total original contract price is earned and the Baseline Schedule, as specified under Section 1.05.08, is accepted, 75 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

4. When 30 percent of the total original contract price is earned and the Baseline Schedule, as specified under Section 1.05.08, is accepted, 100 percent of the "Mobilization" line item, minus any previous payments, will be certified for payment.

Project Closeout as defined in Article 1.20-1.03.01 shall include demobilization of plant and equipment, completion of all physical work, and administrative closeout items necessary to satisfy all Contract requirements. Project Closeout will be paid in the manner described hereinafter:

1. When the non-administrative project completion requirements (as specified under Article 1.08.13) and the administrative completion requirements (as specified under Article 1.08.14) have been satisfied, 100 percent of the "Project Closeout" line item will be certified for payment."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 2.02
ROADWAY EXCAVATION, FORMATION OF
EMBANKMENT AND DISPOSAL OF
SURPLUS MATERIAL**

2.02.01 – Description:

In the first sentence, insert “, swales” between “channels” and “and other miscellaneous construction to the ...”

2.02.04 – Method of Measurement:

In the second to last Paragraph, replace the last sentence with the following:
“Bituminous parking areas are considered as bituminous concrete pavement.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 2.05
TRENCH EXCAVATION**

2.05.01—Description:

In Paragraph 2, delete the only sentence and replace with the following:

“2) The removal of stormwater drainage structures, stormwater pipes and appurtenances beyond the limits of the roadway and structure excavation.”

In Subarticle 2, Rock in Trench, delete the only sentence and replace with the following:

“(2) Rock, insofar as it applies to trench excavation, shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures, reinforced concrete pipe, Portland cement concrete pavement or base, of 1/2 cubic yard (0.5 cubic meters) or more in volume, removed as indicated or directed from within the payment lines for trench excavation.”

2.05.04—Method of Measurement:

*In the first sentence under **Horizontal Payment Limits** insert “culvert ends,” between “pipe culverts,” and “pipe arches,”*

2.05.05—Basis of Payment:

In Paragraph 13 - Delete the entire sentence “There will be no direct payment for the plugging of existing pipes...” and replace it with the following:

“There will be no direct Payment for the plugging of existing pipes, removal and disposal of metal or plastic pipes or for the breaking up of floors in drainage structures being abandoned. The cost shall be included in the contract unit prices of the drainage and excavation items.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 2.12
SUBBASE**

2.12.02 – Materials:

Delete the second sentence: "Grading 'B' shall be used."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 2.16
PERVIOUS STRUCTURE BACKFILL**

2.16.01 - Description:

Add the following sentence after the only sentence:

“This item shall also consist of furnishing and placing crushed stone or gravel in permeable material bags at the inlet ends of weep holes in structures to the dimensions indicated on the plans or as ordered by the Engineer.”

2.16.02 – Materials:

Add the following paragraph after the only sentence:

- “ The materials for bagged stone shall conform to the following requirements:
1. The crushed stone or gravel shall conform to the grading requirements of Article M.01.01 for No. 3 or No. 4 coarse aggregate or a mixture of both.
 2. The bag shall be of permeable material sized to contain 1 c.f. (0.03 cu.m) of loosely packed granular material.”

2.16.03 - Construction Methods:

Add the following paragraph at the end of the section:

“ Where weep holes are installed, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the pervious material into the weep hole. Approximately 1 c.f. (0.03 cu.m) of crushed stone or gravel shall be enclosed in each of the permeable material bags. All bags shall then be securely tied at the neck with cord or wire so that the enclosed material is contained loosely. The filled bags shall be stacked at the weep holes to the dimensions shown on the plans or as directed by the Engineer. The bags shall be unbroken at the time pervious material is placed around them, and bags which are broken or burst prior to or during the placing of the pervious material shall be replaced at the Contractor’s expense.”

2.16.04 - Method of Measurement:

Add the following paragraph after the only paragraph:

“ There will be no direct payment for bagged stone, but the cost thereof shall be included in the cost of the work for “Pervious Structure Backfill.””

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 3.04
PROCESSED AGGREGATE BASE**

Delete the entire Section and replace with the following:

“ 3.04.01 - Description: The base shall consist of a foundation constructed on the prepared subbase or subgrade in accordance with these specifications and in conformity with the lines, grades, compacted thickness and typical cross-section as shown on the plans.

3.04.02 - Materials: All materials for this work shall conform to the requirements of Article M.05.01.

3.04.03 - Construction Methods: Only one type of coarse aggregate shall be used on a Project unless otherwise permitted by the Engineer.

Prior to placing the processed aggregate base, the prepared subbase or subgrade shall be maintained true to line and grade, for a minimum distance of 200 ft (60 m) in advance of the work. None of the aggregate courses shall be placed more than 500 ft (150 m) ahead of the compaction and binding operation on that particular course.

The processed aggregate base shall be spread uniformly by a method approved by the Engineer. The thickness of each course shall not be more than 4 inches (100 millimeters) after compaction, unless otherwise ordered.

After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 lbs/in (52.5 N/mm) of contact width and shall have a weight (mass) not less than 10 t (9100 kg). Vibratory units shall have a static weight (mass) of not less than 4 t (3650 kg). Water may be used during the compaction and binding operation and shall be applied from an approved watering device. The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 in (150 mm) and progress towards the middle, parallel with the centerline of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of super-elevation and special cross slope shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. The amount of compactive effort shall in no case shall be less than four (4) complete passes of the compacting and binding operations. All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the road. The dry density of each layer of processed aggregate base after compaction shall not be less than ninety-five percent (95%) of the dry density

for that material when tested in accordance with AASHTO T180, Method D.

Should the subbase or subgrade material become churned up or mixed with the processed aggregate base at any time, the Contractor shall, without additional compensation remove the mixture. The Contractor shall add new subbase material, if required, and reshape and recompact the subbase in accordance with the requirements of Article 2.12.03. New aggregate material shall be added, compacted and bound, as hereinbefore specified, to match the surrounding surface.

Any surface irregularities which develop during, or after work on each course, shall be corrected by loosening material already in place and removing or adding aggregate as required. The entire area, including the surrounding surface, shall be re-compacted and rebound until it is brought to a firm and uniform surface satisfactory to the Engineer.

3.04.04 - Method of Measurement: Processed Aggregate Base will be measured horizontally in-place after final grading and compaction. Materials placed beyond the horizontal limits indicated on the plans will not be measured for payment.

The total thickness shall be as indicated on the plans, or as ordered by the Engineer and within a tolerance of minus three-fourths of an inch ($-\frac{3}{4}$ ") to plus one-half inch ($+\frac{1}{2}$ ") (-19 mm to +13 mm).

Measurements to determine the thickness will be taken by the Engineer at intervals of 500 ft (150 m) or less, along lanes, and shall be considered representative of the lane. For the purpose of these measurements, a shoulder will be considered a lane.

If a thickness measurement is taken and found deficient, additional measurements considered necessary by the Engineer will be taken to determine the longitudinal limits of the deficiency. Areas not within allowable tolerances shall be corrected, as ordered by the Engineer, without additional compensation to the Contractor.

3.04.05 - Basis of Payment: This work will be paid for at the Contract unit price per cubic yard (cubic meter) for "Processed Aggregate Base," complete in place, which price shall include all materials, tools, equipment and work incidental thereto.

Pay Item	Pay Unit
Processed Aggregate Base	c.y. (cu.m)"

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 4.01
CONCRETE FOR PAVEMENT**

Article 4.01.03—Construction Methods:

Replace Subarticle A. “Composition” with the following:

“ A. Material Documentation, Transportation and Testing: All material delivered to the Project shall be documented, transported and testing in accordance with Subarticle 6.01.03-3 Transportation and Delivery of Concrete and Subarticle 6.01.03-4 Acceptance Testing and Test Specimens. The plastic properties for concrete pavement shall conform to the standard mix properties as indicated in Subarticle 6.01.03-4a.

In addition, the air content of the plastic concrete shall be determined in accordance with AASHTO Method T152, Pressure Method. No alternative method is acceptable.”

Delete Subarticles B, C, D and E.

Change Subarticle F “Placing Concrete” to be Subarticle B and as follows:

Article 4.01.03-B. Placing Concrete:

3. Placement:

In the last sentence of the first paragraph, change “... tested in accordance with 4.01.03-I ...” to read “... tested in accordance with Subarticle 4.01.03-D ...”

6. Joints:

(e) Load Transfer Devices:

Change the only sentence as follows:

“Load transfer devices shall conform to the requirements of Article M.03.08.”

7. Curing:

(a) Liquid Membrane-Forming Cure:

Change the first sentence as follows:

“The liquid curing compound shall conform to Subarticle M.03.04-3.”

(b) Moist Curing:

Change the end of the first sentence as follows:

“... moist mats of the size and quality specified in Subarticle M.03.04-2.”

(c) Cover Sheet Curing:

Change the end of the first sentence as follows:

“... paper or polyethylene cover sheets conforming to Subarticle M.03.04-4.”

Change Subarticle G “Protection of Pavement” to be Subarticle C.

Change Subarticle H “Riding Surface Tests” to be Subarticle D.

Change Subarticle I “Flexural Testing of Concrete” to be Subarticle E.

Change Subarticle J “Opening to Traffic” to be Subarticle F.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 5.08
SHEAR CONNECTORS**

5.08.02 – Materials:

Replace the only paragraph with the following:

“ Stud shear connectors shall conform to the requirements of Subarticle M.06.02-4 Welded Stud Shear Connectors.”

5.08.03 – Construction Methods:

Replace the last sentence of the third paragraph with the following:

“ Stud shear connectors may be stacked to meet heights greater than the 8 in (200 mm) maximum for individual studs.”

Replace the last sentence of the fifth paragraph with the following:

“ Studs exhibiting no signs of failure after bending shall be left in the bent position, if allowed by the Engineer.”

5.08.04 – Method of Measurement:

Delete the entire article and replace with the following:

“ Installed and accepted shear connectors will be measured as units.
For stacked studs, the Department will measure for payment any stack higher than 8 in (200 mm) as two (2) studs.”

5.08.05—Basis of Payment:

Delete the entire article and replace with the following:

“ This work will be paid for at the Contract unit price each for “Shear Connectors,” which price shall include all materials, tools, equipment and labor incidental thereto for all work under this item on the Project.

Pay Item	Pay Unit
Shear Connectors	ea. (ea.)”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 5.14
PRESTRESSED CONCRETE MEMBERS**

5.14.03 – Construction Methods:

2. Prestressing:

Change the outline level of “Final Stressing of Straight Strands:” and “Final Stressing of Draped Strands:” and their subsections as follows:

- “ **A. Final Stressing of Straight Strands:**
 (1) Single-strand tensioning:
 (2) Multiple-strand tensioning:
B. Final Stressing of Draped Strands:
 (1) Partial stressing and subsequent strains:
 (2) Final stressing in draped position:”

5. Finishing: Deck Units:

Change the first sentence as follows:

“Deck units in structures that will have a bituminous concrete wearing surface shall be given a float finish on the top surface as specified in Subarticle 6.01.03-10.”

9. Joining Deck Units:

Change the end of the last sentence of the first paragraph as follows:

“... shall be filled with non-shrink grout conforming to the requirements of Article M.03.05.”

12. Inspection:

Change the beginning of the first sentence as follows:

“The provisions of Subarticle 6.03.03-3 (Shop Fabrication), (a) Notification shall apply to the steel items, ...”

16: Methods and Equipment:

Change the last sentence as follows:

“The results of this investigation, including computations, shall be submitted to the Engineer.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 6.01
CONCRETE FOR STRUCTURES**

Delete the entire Section and replace it with the following:

**SECTION 6.01
CONCRETE FOR STRUCTURES**

- 6.01.01—Description**
- 6.01.02—Materials**
- 6.01.03—Construction Methods**
- 6.01.04—Method of Measurement**
- 6.01.05—Basis of Payment**

6.01.01—Description: This item shall include concrete for use in bridges and culverts, walls, catch basins, drop inlets and other incidental construction as required. The concrete shall be composed of Portland cement, pozzolans, fine and coarse aggregate, admixtures and water, prepared and constructed in accordance with these specifications, at the locations and of the form dimensions and class shown on the plans, or as directed by the Engineer.

The use of concrete from dry batch or central mixed plants is permitted for all concrete mixtures.

6.01.02—Materials: The materials for this work shall conform to the requirements of Section M.03.

6.01.03—Construction Methods:

1. Falsework and Forms: Falsework is considered to be any temporary structure which supports structural elements of concrete, steel, masonry or other material during the construction or erection. Forms are considered to be the enclosures or panels which contain the fluid concrete and withstand the forces due to its placement and consolidation. Forms may in turn be supported on falsework.

This work shall consist of the construction and removal of falsework and forms that are designed by the Contractor in the execution of the work, and whose failure to perform properly could adversely affect the character of the Contract work or endanger the safety of adjacent facilities, property, or the public. Falsework and forms shall be mortar tight and of sufficient rigidity and strength to safely support all loads imposed and to produce in the finished structure the lines and grades indicated in the Contract documents. Forms shall also impart the required surface texture and rustication and shall not detract from the uniformity of color of the formed surfaces. Forms shall be of wood, steel or other material approved by the Engineer.

- (a) **Design:** The design of falsework and formwork shall conform to the *AASHTO Guide Design Specifications for Bridge Temporary Works*, or to other established and generally accepted design codes such as ACI Standard *ACI 347 Recommended Practice for Concrete Formwork* or specific form or falsework manufacturer specifications. When other than new or undamaged materials are used, appropriate reductions in allowable stresses, and decreases in resistance factors or imposed loads shall be used for design.
- (b) **Loads:** The design of the falsework and forms shall be based on load factors specified in the *AASHTO LRFD Bridge Design Specifications* and all applicable load combinations shall be investigated. The design load for falsework shall consist of the sum of appropriate dead and live vertical loads and any horizontal loads.

As a minimum, dead loads shall include the weight (mass) of the falsework and all construction material to be supported. The combined unit weight (density) of concrete, reinforcing and pre-stressing steel and forms that is supported shall be assumed to be not less than:

1. Normal-weight (normal-density) concrete: 0.16 kip/ft³ (2560 kg/m³)
2. Lightweight (low-density) concrete: 0.13 kip/ft³ (2080 kg/m³)

Live loads shall consist of the actual weight (mass) of any equipment to be supported, applied as concentrated loads at the points of contact and a uniform load of not less than 0.02 kip/ft² (0.001 MPa) applied over the area supported, plus 0.075 kip/ft (1.10 N/mm) applied at the outside edge of deck overhangs.

The horizontal load used for the design of the falsework bracing system shall be the sum of the horizontal loads due to equipment; construction sequence including unbalanced hydrostatic forces from fluid concrete and traffic control devices; stream flow, when applicable; and an allowance for wind. However, in no case shall the horizontal load to be resisted in any direction be less than two percent (2%) of the total dead load.

For post-tensioned structures, the falsework shall also be designed to support any increase in or redistribution of loads caused by tensioning of the structure. Loads imposed by falsework onto existing, new, or partially completed structures shall not exceed those permitted in 6.01.03-12, "Application of Loads."

- (c) **Working Drawings:** The working drawings for falsework and formwork shall be prepared in accordance with Article 1.05.02 whenever the falsework or formwork exceeds 14.0 feet (4300 mm) in height or whenever vehicular, marine, or pedestrian traffic may travel under or adjacent to the falsework or formwork. Working drawings shall include the sequence, method and rate of placement of the concrete.

Manufacturer catalog cuts or written installation procedures shall be provided for any clips, braces, hangers or other manufactured parts used with the formwork or falsework.

- (d) Construction:** Forms and falsework shall be built true to lines and grades, shall be strong, stable, firm, mortar-tight and adequately braced or tied, or both. They shall be designed and constructed to withstand all loads and pressures including those imposed by plastic concrete, taking full account of the stresses due to the rate of placement, effect of vibration and conditions brought about by construction methods. Forms and falsework shall be constructed to compensate for variations in camber of supporting members and allow for deflections.

Falsework and formwork shall be chamfered at all sharp corners, unless otherwise ordered or permitted, and shall be given a slight bevel or draft in the case of projections to ensure satisfactory removal. Materials for falsework and formwork and their supports, ties and bracing, shall be of the type, quality and strength to achieve the structural requirements. Form material in contact with concrete shall provide the finished concrete surface smoothness as specified in 6.01.03-10, "Finishing Concrete Surfaces," and have a uniform appearance.

Falsework and formwork shall be treated with form oil or other release agent approved by the Engineer before the reinforcing steel is placed, or self-releasing forms approved by the Engineer may be used. Release agents which will adhere to or discolor the concrete shall not be used.

Falsework and formwork for concrete surfaces exposed to view shall produce a smooth surface of uniform texture, free of voids, indentations, protrusions and bulges. Panels lining falsework and formwork shall be arranged so that the joint lines form a symmetrical pattern conforming to the general lines of the structure. The same type of form-lining material shall be used throughout each element of a structure. Falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/4 inch (6 mm) when checked with a 4 foot (1200 mm) straightedge or template.

For non-exposed surfaces the falsework and formwork shall be sufficiently rigid so that the undulation of the concrete surface shall not exceed 1/2 inch (13 mm) when checked with a 4 foot (1200 mm) straightedge or template.

Metal ties and anchors to hold the falsework and formwork in alignment and location shall be so constructed that the metal work can be removed to a depth of at least 2 inches (50 mm) from the concrete surface without damage to the concrete. All cavities resulting from the removal of metal ties shall be filled after removal of forms with cement mortar of the same proportions used in the body of the work or other materials approved by the Engineer, and the surface finished smooth and even, and if exposed in the finished work, shall conform to the texture and color of adjacent surfaces. With permission of the Engineer, the Contractor need not remove from the underneath side of bridge decks portions of metal devices used to support reinforcing steel providing such devices are of material, or are adequately coated with material, that will not rust or corrode. When coated reinforcing steel is required, all metal ties, anchorages, or spreaders that remain in the concrete shall be of corrosion-resistant material or coated with a dielectric material.

Forms shall be clean and clear of all debris. For narrow walls and columns where the bottom of the form is inaccessible, an access opening will be allowed in the form and falsework for cleaning out extraneous material.

- (e) **Date of Completion:** The year in which the superstructure is completed in its entirety shall be cast in at least two (2) places as shown on the plans unless otherwise ordered by the Engineer. The date shall be placed in diagonally opposite ends of the bridge parapets or as designated by the Engineer. The reverse molds for the date shall be furnished by the Contractor.
- (f) **Bridge Decks:** After erection of beams and prior to placing falsework and forms, the Contractor shall take elevations along the top of the beam at the points shown on the plans or as directed by the Engineer. The Contractor shall calculate the haunch depths and provide them to the Engineer a minimum of seven (7) days prior to installing the falsework and forms. The Contractor shall also provide calculations for the setting of the overhang brackets based on the final beam deflection. These calculations shall be based on the final proposed deck grade and parapet elevations.

Falsework or formwork for deck forms on girder bridges shall be supported directly on the girders so that there will be no appreciable differential settlement during placing of the concrete. Girders shall be either braced and tied to resist any forces that would cause rotation or torsion in the girders caused by the placing of concrete for diaphragms or decks, or shown to be adequate for those effects. Unless specifically permitted, welding of falsework support brackets or braces to structural steel members or reinforcing steel shall not be allowed.

- (g) **Stay-In-Place Metal Forms for Bridge Decks:** These forms may be used if shown in the Contract or approved by the Engineer. Prior to the use of such forms and before fabricating any material, the Contractor shall submit working drawings to the Engineer for review in accordance with Article 1.05.02, Working Drawings. These drawings shall include the proposed method of form construction, erection plans including placement plans, attachment details, weld procedure(s), material lists, material designation, gage of all materials, and the details of corrugation. Also, copies of the form design computations shall be submitted with the working drawings. Any changes necessary to accommodate stay-in-place forms, if approved, shall be at no cost to the Department.

The metal forms shall be designed on the basis of the dead load of the form, reinforcement and the plastic concrete, including the additional weight (mass) of concrete [considered to be equivalent to the weight (mass) imposed by an additional concrete thickness equal to three percent (3%) of the proposed deck thickness, but not to exceed 0.3 inches (8 mm)] due to the deflection of the metal forms, plus 50 pounds per square foot (2.40 kilopascals) for construction loads. The allowable stress in the corrugated form and the accessories shall not be greater than 0.725 times the yield strength of the furnished material and the allowable stress shall not exceed 36,000 psi (250 megapascals). The span for design and deflection shall be the clear distance between edges of the beams or girders less 2 inches (50 mm) and shall be measured parallel to the form flutes. The maximum deflection under the weight (mass) of plastic concrete, reinforcement, and forms shall not exceed 1/180 of the form span or 0.5 inches (13 mm), whichever is less. In no case shall the loading

used to estimate this deflection be less than 120 pounds per square foot (586 kilograms per square meter). The permissible form camber shall be based on the actual dead load condition. Camber shall not be used to compensate for deflection in excess of the foregoing limits. The form support angles shall be designed as a cantilever with horizontal leg not more than 3 inches (75 mm).

No stay-in-place metal forms shall be placed over or be directly supported by the top flanges of beams or girders. The form supporting steel angles may be supported by or attached to the top flanges.

Stay-in-place metal forms shall not be used in bays where longitudinal slab construction joints are located, under cantilevered slabs such as the overhang outside of fascia members, and bridges over a salt-laden body of water with a clearance of less than 15 feet (4.5 m) above mean high water level.

Welding to the top flanges of steel beams and girders is not permitted in the areas where the top flanges are in tension, or as indicated on the plans. Alternate installation procedures shall be submitted addressing this condition.

Drilling of holes in pre-stressed concrete beams or the use of power-actuated tools on the pre-stressed concrete beams for fastening of the form supports to the pre-stressed concrete beams will not be permitted. Welding of the reinforcing steel to the pre-stressed units is not permitted.

All edges of openings cut for drains, pipes, and similar appurtenances shall be independently supported around the entire periphery of the opening.

All fabricated stay-in-place metal forms shall be unloaded, stored at the Project site at least 4 inches (100 mm) above the ground on platforms, skids or other suitable supports and shall be protected against corrosion and damage and handled in such a manner as to preclude damage to the forms. Damaged material shall be replaced at no additional cost to the State.

Any exposed form or form support metal where the galvanized coating has been damaged, shall be thoroughly cleaned, wire brushed, then coated with two (2) coats of Zinc Dust – Zinc Oxide primer, FS No. TT-P-641d, Type II or another product acceptable to the Engineer.

The forms shall be installed from the topside in accordance with the manufacturer's recommended installation procedures. The form supports shall ensure that the forms retain their correct dimensions and positions during use at all times. Form supports shall provide vertical adjustment to maintain design slab thickness at the crest of corrugation, to compensate for variations in camber of beams and girders and to allow for deflections. Stay-in-place metal forms shall have a minimum depth of the form valley equal to 2 inches (50 mm). The forms shall have closed tapered ends. Lightweight filler material shall be used in the form valleys.

All field cutting shall be done with a steel cutting saw or shears including the cutting of supports, closures and cutouts. Flame cutting of forms is not permitted.

All welding shall be performed by Department certified welders in accordance with the "Welding" Subarticle in Section 6.03. Welding of forms to supports is not permitted.

The steel form supports shall be placed in direct contact with the flange of stringer or floor beam flanges and attached by bolts, clips, welding where permitted, or other approved means. Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. The forms shall be securely fastened to form supports with self-drilling fasteners and shall have a minimum bearing length of 1 inch (25 mm) at each end. In the areas where the form sheets lap, the form sheets shall be securely fastened to one another by fasteners at a maximum spacing of 18 inches (450 mm). The ends of the form sheets shall be securely attached to the support angles with fasteners at a maximum spacing of 18 inches (450 mm), or two (2) corrugation widths, whichever is less.

The depth of the concrete slab shall be as shown on the plans and the corrugated forms shall be placed so that the top of the corrugation will coincide with the bottom of the deck slab. No part of the forms or their supports shall protrude into the slab. All reinforcement in the bottom reinforcement mat shall have a minimum concrete cover of 1 inch (25 mm) unless noted otherwise on the plans.

The completed stay-in-place metal form system shall be sufficiently tight to prevent leakage of mortar. Where forms or their installation are unsatisfactory in the opinion of the Engineer, either before or during placement of the concrete, the Contractor shall correct the defects before proceeding with the work.

- (h) Construction Joints:** Construction joints other than those shown on the plans will not be permitted without prior approval of the Engineer. In joining fresh concrete to concrete that has already set, the work already in place shall have all loose and foreign material removed, and the surface roughened and thoroughly drenched with water.

All reinforcing steel shall extend continuously through joints. Where unplanned construction joints may be needed, they shall be constructed as directed by the Engineer.

- (i) Expansion and Contraction Joints:** Expansion and contraction joints shall be constructed at the locations and in accordance with the details specified in the Contract documents. The forming of joint openings shall be dimensioned in accordance with the joint manufacturer's design requirements. Joints include open joints, filled joints, joints sealed with sealants, joints reinforced with steel armor plates or shapes, paraffin coated joints, and joints with combinations of these features.

For mechanical joint systems, the concrete shall be placed in such a manner that does not interfere with the movement of the joint.

Open joints shall be placed at locations designated on the plans and shall be formed by the insertion and subsequent removal of templates of wood, metal or other suitable material. The templates shall be so constructed that their removal may be readily accomplished without damage to the work.

Filled joints shall be made with joint filler, the materials for which shall conform to the requirements of the plans and of these specifications.

- (j) **Pipes, Conduits and Utility Installations:** The Contractor shall coordinate the installation of pipes, conduits and utilities as shown on the plans and in conformance with the Contract documents or as directed by the Engineer. The openings accommodating such pipe, conduit and utility installations shall be incorporated into the formwork by the Contractor.
- (k) **Anchorage:** Anchor bolts and systems shall be set to the requirements of the plans and Contract documents. Anchor bolts and systems shall be clean and free of dirt, moisture or other foreign materials at the time of installation. The anchor bolts and systems shall be installed prior to placing concrete.

With the Engineer's approval, the Contractor may install anchorages after placement and setting of the concrete or in formed holes. The anchorages shall be installed into drilled or formed holes having a diameter and a depth suitable to receive the bolts in accordance with the grout manufacturer's requirements. Such holes shall be located to avoid damage to the existing reinforcement. All holes shall be perpendicular to the plane surface. The Contractor shall take every precaution necessary to prevent damage to the concrete due to freezing of water or grout in anchor bolt holes.

- (l) **Ornament or Reverse Moulds:** Ornamental work, when so noted on the plans, shall be formed by the use of reverse moulds. These moulds shall be produced by a qualified manufacturer approved by the Engineer. They shall be built in accordance with the general dimensions and appearance shown on the plans. The Contractor shall submit all detailed drawings, models, or carvings for review by the Engineer before the moulds are made.

The Contractor shall be responsible for their condition at all times, and shall be required to remove and replace any damaged or defective moulds at no additional cost to the State.

The surfaces of the moulds shall be given a coating of form release agent to prevent the adherence of concrete. Any material which will adhere to or discolor the concrete shall not be used.

Form Liners, if required, shall be installed per the Contract Special Provisions.

- (m) **Removal of Falsework and Forms:** The Contractor shall consider the location and character of the structure, the weather, the materials used in the mix, and other conditions influencing the early strength of the concrete when removing forms and falsework. Methods of removal likely to cause damage to the concrete surface shall not be used.

Supports shall be removed in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. For structures of two (2) or more spans, the sequence of falsework release shall be as specified in the Contract documents or as approved by the Engineer.

Removal shall be controlled by field-cured cylinder tests. The removal shall not begin until the concrete has achieved seventy-five percent (75%) of the design compressive strength. To facilitate finishing, side forms carrying no load may be removed after twenty-four (24) hours with the permission of the Engineer, but the curing process must be continued for seven (7) days.

When the results of field-cured cylinder tests are unavailable, the following periods, exclusive of days when the temperature drops below 40°F (5°C), may govern the removal of forms:

Form Removal Requirements	
Structure Element	Minimum Time Period
Arch Centers, centering under beams, pier caps, and unsupported elements	14 days
Slabs on grade, Abutments and Walls	24 hours
Columns	2 days
Bridge Decks	28 days

The Contractor may submit alternate methods to determine the in-place strength of the concrete for removal of forms and falsework, for review and approval by the Engineer.

2. Protection from Environmental Conditions: The concrete shall be protected from damage due to weather or other environmental conditions during placing and curing periods. In-place concrete that has been damaged by weather conditions shall be either repaired to an acceptable condition or removed and replaced as determined by the Engineer.

(a) Rain Protection: The placement of concrete shall not commence or continue unless adequate protection satisfactory to the Engineer is provided by the Contractor.

(b) Hot Weather Protection: When the ambient air temperature is above 90°F (32°C), the forms, which will come in contact with the mix shall be cooled to below 90°F (32°C) for a minimum of one (1) hour prior to and one (1) hour after completion of the concrete placement by means of a water spray or other methods satisfactory to the Engineer.

(c) Cold Weather Protection: When there is a probability of ambient air temperature below 40°F (5°C) during placement and curing, a Cold-Weather Concreting Plan shall be submitted to the Engineer for review and comment. The Plan shall detail the methods and equipment, including temperature measuring devices, that will be used to ensure that the required concrete and air temperatures are maintained.

1. Placement: The forms, reinforcing steel, steel beam flanges, and other surfaces which will come in contact with the mix shall be heated to a minimum of 40°F (5°C), by methods satisfactory to the Engineer, for a minimum of one (1) hour prior to, and maintained throughout, concrete placement.

2. Curing: For the first six (6) days, considered the initial cure period, the concrete shall be maintained at a temperature of not less than 45°F (7°C) and the air temperature surrounding the structure shall be maintained at a temperature of not less than 60°F (16°C). When the concrete mix includes pozzolans or slag, the initial cure period shall be increased to ten (10) days. After the initial cure period, the air surrounding the structure shall be maintained above 40° F (5°C) for an additional eight (8) days. If external heating is employed, the heat shall be applied and withdrawn gradually and uniformly so that no part of the concrete surface is heated to more than 90°F (32°C) or caused to change temperature by more than 20°F (11°C) in eight (8) hours. The Engineer may reduce or increase the amount of time that the structure must be protected or heated based on an indication of in-place concrete strength acceptable to the Engineer.

(d) Additional Requirements for Bridge Decks: Prior to the application of curing materials, all the concrete placed on bridge decks shall be protected from damage due to rapid evaporation by methods acceptable to the Engineer. During periods of low humidity (less than 60% relative humidity), sustained winds of 25 mph (40 kph) or more, or ambient air temperatures greater than 80°F (25°C) the Contractor shall provide written details of additional measures to be taken during placement and curing.

Protection may include increasing the humidity of the surrounding air with fog sprayers and employing wind-breaks or sun-shades. Additional actions may include reduction of the temperature of the concrete prior to placement, scheduling placement during cooler times of days or nights, or a combination of these actions.

(e) Concrete Exposed to Salt Water: No Construction joints shall be formed between the levels of extreme low water and extreme high water or the upper limit of wave action as determined by the Engineer.

3. Transportation and Delivery of Concrete: All material delivered to the Project shall be supplied by a producer qualified in accordance with Section M.03. The producer shall have sufficient plant capacity and trucks to ensure continuous delivery at the rate required to prevent the formation of cold joints.

(a) Material Documentation: All vendors producing concrete must have their weigh scales and mixing plant automated to provide a detailed ticket. Delivery tickets must include the following information:

1. State of Connecticut printed on ticket
2. Name of producer, identification of plant
3. Date and time of day
4. Type of material
5. Cubic yards (cubic meters) of material loaded into truck
6. Project number, purchase order number, name of Contractor (if Contractor other than producer)
7. Truck number for specific identification of truck
8. Individual aggregate, cement, water weights (masses) and any admixtures shall be printed on plant tickets
9. Water/cement ratio, and
10. Additional water allowance in gallons (liters) based on water/cement ratio for mix

A State inspector may be present to monitor batching and weighing operations.

The Contractor shall notify the Engineer immediately if, during the production day, there is a malfunction of the recording system in the automated plant or weigh scales.

Manually written tickets containing all required information may be allowed for up to one (1) hour after malfunction provided they are signed by an authorized representative of the producer.

- (b) Transportation of Mixture:** Trucks delivering concrete shall be qualified in accordance with Section M.03.

If the concrete mix arrives at the Project with a slump lower than allowed by specification, water may be considered as a means to temper concrete to bring the slump back to within specification. This tempering may only be done prior to discharge with the permission of the Engineer. The quantity of water in gallons (liters) added to the concrete cannot exceed the allowance shown on the delivery ticket.

The concrete shall be completely discharged into the forms within one and one-half (1-1/2) hours from the batch time stamped on the delivery ticket. This time may be extended if the measured temperature of the concrete is below 90°F (32°C). This time may also be reduced if the temperature of the concrete is over 90°F (32°C).

Rejected concrete shall be disposed of by the Contractor at no cost to the State.

The addition of chemical admixtures or air entrainment admixtures at the Project site, to increase the workability or to alter the time of set, will only be permitted if prior approval has been granted by the Engineer. The addition of air entrainment admixtures at the Project site will only be permitted by the producer's quality control staff. The Contractor is responsible for follow-up quality control testing to verify compliance with the Specifications.

4. Acceptance Testing and Test Specimens: The Contractor shall furnish the facilities and concrete required for sampling, transport to the testing location in the field, performing field testing and for casting sample cylinders for compressive-strength determinations. The Department will furnish personnel for sampling and casting Acceptance specimens and the number of specimens required will be determined by the Engineer. The equipment for the Department's testing is provided for elsewhere in the Contract.

- (a) Temperature, Air Content and Slump:** Field testing in accordance with AASHTO T-23, "Making and Curing Concrete Test Specimens in the Field" will be performed at the point of placement and at a frequency determined by the Engineer.

English Units

Standard Mix Class	Air Content	Slump	Concrete Temperature
A (3300 psi)	6.0 +/- 1.5%	4" +/- 1"	60°-90°F
C (3300 psi)			
F (4400 psi)			
Modified Standards ¹	6.0 +/- 1.5% ²	4" +/- 1" ²	
Special Provision Mix ³	As specified	As specified	
¹ Modifications to Standard Mixes, including mixes placed by pumping, shall be reviewed by the Engineer prior to use. These include but are not limited to the use of chemical admixtures such as high range water reducing (HRWR) admixtures and the use of coarse aggregate sizes for that class not specified in M.03.			
² If the <u>only</u> modification is the addition of HRWR, the maximum allowable slump shall be 7 inches.			
³ All concrete mixes with a mix design strength not shown in the table must be approved by the Engineer on a case-by-case basis. Limits on the plastic properties and strength requirements of these mixes are listed in the Specifications.			

Metric Units

Standard Mix Class	Air Content	Slump	Concrete Temperature
A (23MPa)	6.0 +/- 1.5%	100 mm +/- 25mm	15.5°-32°C
C (23 MPa)			
F (30 MPa)			
Modified Standards ¹	6.0 +/- 1.5% ²	100mm +/- 25mm ²	
Special Provision Mix ³	As specified	As specified	
¹ Modifications to Standard Mixes, including mixes placed by pumping, shall be reviewed by the Engineer prior to use. These include but are not limited to the use of chemical admixtures such as high range water reducing (HRWR) admixtures and the use of coarse aggregate sizes for that class not specified in M.03.			
² If the <u>only</u> modification is the addition of HRWR, the maximum allowable slump shall be 175 mm.			
³ All concrete mixes with a mix design strength not shown in the table must be approved by the Engineer on a case-by-case basis. Limits on the plastic properties and strength requirements of these mixes are listed in the Specifications.			

(b) Acceptance Testing and Compressive Strength Specimens: Concrete samples are to be taken at the point of placement into the forms or molds. Representatives of the Engineer will sample the mix.

The Contractor shall provide and maintain facilities on the Project site, acceptable to the Engineer, for sampling, transporting the initial sample, casting, safe storage and initial curing of the concrete test specimens as required by AASHTO T-23. This shall include but not be limited to a sampling receptacle, a means of transport of the initial concrete sample from the location of the concrete placement to the testing location, a level and

protected area of adequate size to perform testing, and a specimen storage container capable of maintaining the temperature and moisture requirements for initial curing of Acceptance specimens. The distance from the location of concrete placement to the location of testing and initial curing shall be 100 feet (30 m) or less, unless otherwise approved by the Engineer.

The specimen storage container described in this section is in addition to the concrete cylinder curing box provided for elsewhere in the Contract documents.

After initial curing, the test specimens will be transported by Department personnel and stored in the concrete cylinder curing box until they can be transported to the Division of Materials Testing for strength evaluation.

- (c) Sampling Procedure for Pumping:** It is the responsibility of the Contractor to provide concrete that meets required specifications at the point of placement.

Samples of concrete shall be taken at the discharge end of the pump at the point of placement with the exception of underwater concrete. The Contractor may submit an alternate location to provide a sample from the discharge end of the pump with verification showing that the characteristics of the mix will not be altered from that which would have been attained at the point of placement. The Engineer will review the documentation and other extenuating circumstances when evaluating the request.

In the case of underwater concrete the Contractor shall submit the proposed sampling location with the submittals required in 6.01.03-6(f).

- (d) Additional field testing:** Additional field testing such as density and yield measurements may be required at the time of placement as determined by the Engineer.

5. Progression Cylinders and Compressive Strength Specimens: Progression Cylinders outlined in this section are field cured compressive strength specimens taken for information related to when a structure or segment of a structure can be loaded or put into service, adequacy of curing and protection of concrete in the structure, or when formwork or shoring may be removed from the structure. The information produced from strength results of Progression Cylinders will not be considered for acceptance of the concrete.

The personnel, equipment, and molds for sampling, casting, curing and testing of Progression Cylinders shall be furnished by the Contractor at no expense to the Department.

Sampling, casting, and field curing of the specimens shall be performed in accordance with AASHTO T23 by an ACI Concrete Field Testing Technician Grade 1 or higher and will be witnessed by a representative of the Department.

The sample shall be taken at the point of placement into the forms or molds from one (1) or more of the same truck loads that an Acceptance sample is taken from.

A minimum of two (2) cylinder results will be used to determine in-place strength.

Compression testing shall be performed in accordance with AASHTO T-22 by personnel approved by the Engineer.

A Certified Test Report in accordance with Article 1.06.07 shall be provided to the Engineer reporting the Progression Cylinder test results. A copy of the results of the compressive strength testing shall be provided to the Engineer at least twenty-four (24) hours prior to any Project activity that the results may control.

6. Handling and Placing Concrete: Concrete shall be handled, placed, and consolidated by methods acceptable to the Engineer that will not segregate the mix and shall result in a dense homogeneous concrete. The methods used shall not cause displacement of reinforcing steel or other materials to be embedded in the concrete. Concrete shall not be placed until the forms and all materials have been inspected by the Engineer. All mortar from previous placements, debris, and foreign material shall be removed from the forms and steel prior to commencing placement. The forms and subgrade shall be thoroughly moistened with water immediately before concrete is placed. All water that has ponded within the forms shall also be removed. Temporary form spreader devices shall not be left in place.

All laitance or unsound material shall be removed before placing substructure concrete onto the surface of any concrete placed underwater.

Placement of concrete for each section of the structure shall be performed continuously between construction or expansion joints as shown on the plans. The delivery rate, placing sequence and methods shall be such that fresh concrete is always placed and consolidated against previously placed concrete before initial set has occurred. The temperature of the concrete mixture during placement shall be maintained between 60°F (16°C) and 90°F (32°C). During and after placement of concrete, care shall be taken not to damage the concrete or break the bond with reinforcing steel. Platforms for workers and equipment shall not be supported directly on any reinforcing steel. Forces that may damage the concrete shall not be applied to the forms or reinforcing steel.

(a) Sequence of Placement: The sequence of placement shall be in accordance with the Contract documents or as permitted by the Engineer.

Concrete for integral horizontal members, such as caps, slabs, or footings shall not be placed until the concrete for the columns, substructure, culvert walls and similar vertical members has achieved sufficient strength as stated in 6.01.03-1(m).

The concrete in arches shall be placed in such a manner as to load the formwork uniformly and symmetrically.

The base slab or footings of cast-in-place box culverts shall reach sufficient strength before the remainder of the culvert is constructed.

(b) Placement Methods: The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of intention to place concrete.

Vibrators shall not be used to shift the fresh concrete horizontally. Vibrators shall be adequate to consolidate the concrete and integrate it with the previous lift.

The rate of concrete placement must not produce loadings that exceed those considered in the design of the forms.

The use of chutes and pipes for conveying concrete into the forms must be reviewed by the Engineer. Chutes shall be clean, lined with smooth watertight material and, when steep slopes are involved, shall be equipped with baffles or reverses. When the discharge must be intermittent, a hopper or other device for regulating the discharge shall be provided.

Aluminum shall not be permanently incorporated into the concrete unless otherwise specified.

When placing operations involve dropping the concrete more than 5 feet (1500 mm), the Contractor shall take action to prevent segregation of the mix and spattering of mortar on steel and forms above the elevation of the lift being placed. This restriction shall not apply to cast-in-place pilings.

When using stay-in-place forms, concrete shall not be dropped more than 3 feet (1000 mm) above the top of the forms, and the concrete shall be discharged directly over the beams or girders.

- (c) **Pumping:** The Contractor shall use equipment specifically manufactured to pump concrete mixes and that meets the needs of the specific concrete placement.
- (d) **Consolidation:** Unless otherwise specified, all concrete, except concrete placed under water, shall be sufficiently consolidated by mechanical vibration immediately after placement.

The Contractor shall provide a sufficient number of commercially available mechanical immersion type vibrators to properly consolidate the concrete immediately after it is placed in the forms unless external form vibrators are used. The Contractor shall have an adequate number of operable vibrators available in case of breakdown.

External form vibrators may be used if submitted prior to concrete placement and reviewed by the Engineer.

Vibration shall not be applied directly to the reinforcement or hardened concrete. Special care shall be taken in placing and consolidating concrete around ornamental moulds, form liners and other embedded items. The vibrator shall not touch these items at any time.

- (e) **Additional Requirements for Bridge Decks:** At least fifteen (15) days before the erection of the screed rails, the Contractor shall submit screed erection plans, grades and sequence of concrete placement and proposed rate of placing concrete for review by the Engineer. These plans shall include details of equipment to be

used in the placement and finishing of the concrete, including the number and type of personnel who will be engaged in placing the concrete. The screed equipment shall be a commercially available vibratory system. The use of wooden screeds is prohibited.

When setting screed rails for mechanical finishing, the Contractor shall take into consideration and make proper allowances for the deflection of the bridge superstructure due to all operations.

Screed and runway supports shall not be located on any stay-in-place metal form sheets, form supports or reinforcing steel. The Contractor shall operate the mechanical screed at least twenty-four (24) hours prior to actual placement of the concrete to verify deck survey and equipment operations to the satisfaction of the Engineer.

Concrete shall be deposited in a uniform manner across the entire width being placed, and only two (2) passes of the transverse screed will be permitted over a given deck area, unless otherwise allowed by the Engineer.

If the Contractor proposes to place concrete outside of daylight hours, an adequate lighting system must be provided.

Concrete shall be deposited in accordance with the placement sequence as noted on the plans. If no sequence is indicated, the Contractor shall provide a placement sequence to the Engineer for review. The placement sequence shall proceed in such a manner that the total deflection or settlement of supporting members, and final finishing of the surface will occur before initial set of the concrete takes place.

At construction joints, concrete shall not be placed against the previously placed concrete for at least twelve (12) hours unless otherwise allowed by the Engineer.

- (f) Underwater Placement:** Concrete may only be placed under water within a cofferdam unless otherwise specified in the documents or otherwise allowed by the Engineer. Placement shall begin following inspection and acceptance of the depth and character of the foundation material by the Engineer.

Underwater concrete mixes are considered non-standard designs and shall be submitted to the Engineer for approval. Typically a minimum of ten percent (10%) additional cement than comparable non-underwater mixes will be required.

Underwater concrete shall be placed continuously with the surface of the concrete kept as horizontal as practical. To ensure thorough bonding, each succeeding layer shall be placed before the preceding layer has taken initial set. For large concrete placements, more than one (1) tremie or pump shall be used to ensure compliance with this requirement.

Mass concrete placement requirements, outlined in 6.01.03-6(g), do not apply to underwater concrete.

To prevent segregation, underwater concrete shall be placed in a compact mass, in its final position, by means of a tremie, concrete pump, or other approved method and shall not be disturbed. Still water shall be maintained at the point of deposit. Cofferdams shall be vented during the placement and curing of the concrete to equalize the hydrostatic pressure and thus prevent flow of water through the concrete.

If a tremie is used, the method of depositing the concrete shall be detailed in a working drawing submitted to the Engineer for review. The tube shall have watertight couplings and shall permit the free movement of the discharge end over the area of the work.

- (g) Mass concrete placement:** Mass concrete placement shall be defined as any placement, excluding underwater concrete placement, in which the concrete being cast has dimensions of 5 feet (1500 mm) or greater in each of three (3) different directions. For placements with a circular cross-section, a mass concrete placement shall be defined as any placement that has a diameter of 6 feet (1800 mm) or greater and a height of 5 feet (1500 mm) or greater. For all mass concrete placements, the mix temperature shall not exceed 85°F (30°C) as measured at point of discharge into the forms.

Any special concrete mix design proposed by the Contractor to meet the above temperature requirements shall be submitted to the Engineer for review.

- 7. Finishing Plastic Concrete:** Unless otherwise specified in the Contract documents, after concrete has been consolidated and prior to final curing, all surfaces of concrete that are not placed against forms shall be struck-off to the planned elevation or slope. The surface shall be finished by floating with an acceptable tool. While the concrete is still in a workable state, all construction and expansion joints shall be tooled with an edger. Joint filler shall be left exposed. For requirements on float finish, refer to 6.01.03-10, "Finishing Concrete Surfaces."

After completion of the placing and finishing operation and for at least twelve (12) hours after the concrete has set, the Contractor shall not operate any equipment in the immediate vicinity of the freshly placed concrete if, in the opinion of the Engineer, it could cause excessive vibration, movement or deflection of the forms.

The addition of water to the surface of the concrete to assist in finishing operations will not be permitted.

- (a) Bridge Decks:** After the concrete has been consolidated and brought to the proper elevation by the screed machine, it shall be finished by use of a suitable float. The Contractor shall not disturb the fresh concrete after it has been finished. All finishing work, including the application of the fog spray and placement of the curing mats, shall be performed from work bridges supported above the deck surface. A work bridge shall be made available to the Engineer for inspection of the concrete work.

Surfaces that are to be covered with a waterproofing membrane shall be finished to a smooth surface, free of mortar ridges and other projections and in accordance with the membrane manufacturer's recommendations.

Unless otherwise noted in the Contract, the concrete wearing surfaces shall be given a skid-resistant texture by dragging, brooming, tining, or by a combination of these methods. These methods shall be done after floating and at such time and in such manner that the desired texture will be achieved while minimizing displacement of the larger aggregate particles.

1. Dragging: The surface shall be finished by dragging a seamless strip of damp burlap over the surface. The burlap to be dragged shall consist of sufficient layers and have sufficient length in contact with the concrete to slightly groove the surface. The burlap shall be drawn longitudinally along the surface in a slow manner so as to leave an even texture. The burlap shall be kept damp, clean, and free of particles of hardened concrete. The Contractor may propose an alternate material for the Engineer's consideration.
2. Tining: Tining shall be in a transverse direction using a wire broom, comb, or float having a single row of tines or fins. The tining grooves shall be between 1/16 inch (1.5 mm) and 3/16 inch (5 mm) wide and between 1/8 inch (3 mm) and 3/16 inch (5 mm) deep, spaced 1/2 inch (12.5 mm) to 3/4 inch (20 mm) on centers. Tining shall be discontinued 12 inches (300 mm) from the curb line on bridge decks. The area adjacent to the curbs shall be given a light broom finish longitudinally. As an alternative, tining may be achieved using a machine designed specifically for tining or grooving concrete pavements.

The transverse grooving shall be performed when the grooves can be formed to a maximum depth of 3/16 inch (5 mm) with relative ease and without the walls of the grooves closing in on each other. The tining shall be aligned so as to prevent overlapping of grooves in any two (2) successive transverse passes. The Contractor shall measure the depth of the grooves in the presence of the Engineer with an appropriate device to ensure compliance.

(b) Surface Testing and Correction: The completed surface shall be constructed in accordance with grades and cross slopes shown on the plans. The entire surface shall be checked by the Contractor in the presence of the Engineer, with an acceptable 10 foot (3 meter) straightedge.

1. The surface shall not vary more than +/- 1/8 inch (3 mm) in 10 feet (3 m) for decks which will not be covered with an overlay.
2. The surface shall not vary more than +/- 1/4 inch (6 mm) in 10 feet (3 m) for decks which will be covered with an overlay.

Variances greater than these, which, in the opinion of the Engineer, may adversely affect the riding qualities of the surface shall be corrected, and this shall be done at the expense of the Contractor. The Contractor shall submit a corrective procedure to the Engineer for review and approval. The procedure shall correct such irregularities by methods such as, but not limited to, concrete planing or grooving.

8. Bearing Surfaces: Concrete surfaces under metallic masonry plates and elastomeric bearings shall have a float finish. After the concrete has set, the area which will be in contact with the masonry plate shall be ground as necessary to provide full and even bearing. The finished surface shall not vary from a straightedge laid on the surface in any direction within the limits of the masonry plate by more than 0.0625 inches (1.5 mm). Surfaces which fail to conform shall be ground or filled until acceptable to the Engineer.

9. Curing Concrete: All newly placed concrete shall be cured so as to prevent loss of water by use of the methods specified. The Engineer may request that the Contractor furnish a curing plan.

The duration of the initial and final curing period in total shall continue uninterrupted for a minimum of seven (7) days.

(a) Curing Methods:

1. Forms-In-Place Method: Formed surfaces of concrete may be cured by retaining the forms in place without loosening. During periods of hot weather, water shall be applied to the forms until the Engineer determines that it is no longer required.
2. Water Method: Exposed concrete surfaces shall be kept continuously wet by ponding, spraying, or covering with materials that are kept continuously and thoroughly wet. Such materials may consist of cotton mats, multiple layers of burlap, or other approved materials that do not discolor or otherwise damage the concrete.
3. Waterproof Cover Method: This method shall consist of covering exposed surfaces with a waterproof sheet material to prevent moisture loss from the concrete. The concrete shall be wet at the time the cover is installed. The sheets shall be of the widest practicable width and adjacent sheets shall overlap a minimum of 6.0 inches (150 mm) to form a waterproof cover of the entire concrete surface and shall be adequately secured. Broken or damaged sheets shall be immediately repaired and the concrete shall be remoistened.

(b) Additional Requirements for Bridge Decks:

1. Curing Plan: The Contractor shall submit to the Engineer, at least fourteen (14) days prior to the placement of concrete for the bridge deck, a detailed curing plan that describes the following:
 - A. the initial and final curing durations,
 - B. equipment and materials to be used for curing concrete and monitoring concrete temperature, and
 - C. proposed primary and secondary water and heat sources

2. Initial Curing Period: A water fog spray shall be used by the Contractor from the time of initial placement until the final curing period begins. The amount of fog spray shall be strictly controlled so that accumulations of standing or flowing water on the surface of the concrete shall not occur.

Should atmospheric conditions render the use of fog spray impractical, the Contractor shall request approval from the Engineer to use a curing compound that meets the requirements of Section M.03 in lieu of a fog spray. The application shall be in accordance with the manufacturer's recommendation and be compatible with the membrane waterproofing.

3. Final Curing: After completion of finishing and as soon as any bleed water has dissipated and the concrete reaches sufficient strength to avoid marring, the Final curing period shall begin and the entire concrete surface shall be covered with water-retaining materials such as cotton mats, multiple layers of burlap, or other materials approved by the Engineer. Materials used shall be kept saturated by means of an acceptable sprinkler or wetting system.

The Contractor may cover the wet water-retaining material with a suitable polyethylene film to minimize evaporation during the curing period. The use of the polyethylene film does not relieve the Contractor from maintaining saturation of the curing materials.

4. Temperature Monitoring: The internal temperature of the concrete shall be monitored with a calibrated continuous recording thermometer for a minimum of seven (7) days. The air temperature at the concrete surface or the air temperature between the concrete surface and its protective covering shall be monitored with a minimum of one (1) recording thermometer.

The number and placement of the thermometers will be determined by the Engineer. A minimum of two (2) thermometers per concrete placement shall be provided by the Contractor.

The following types of thermometers shall be used to monitor curing temperatures:

- A. Continuously Recording Thermometer: The thermometer shall be capable of continuously recording temperatures within a range of -4 °F to 122 °F (-20°C to 50°C) for a minimum of twenty-four (24) hours.
- B. Maximum–Minimum Recording Thermometer: For all placements, the thermometer shall be capable of recording maximum and minimum temperatures in a range of -4 °F to 122 °F (-20°C to 50°C).

10. Finishing Concrete Surfaces: Any minor repairs due to fins, bulges, offsets and irregular projections shall be performed immediately following the removal of forms. For areas of newly placed concrete that are honeycombed or segregated the Contractor shall provide a written corrective procedure for review by the Engineer prior to the work being performed. Construction and expansion joints in the completed work shall be left

carefully tooled and free of mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

The cavities produced by form ties and all other holes, broken corners or edges, and other defects shall be cleaned, saturated with water, pointed and trued with a mortar conforming to M.11.04. Cement similar in color to the exposed surface being repaired shall be added to the mortar. Mortar used in pointing shall be used within one (1) hour of mixing. The concrete shall be finished as defined below if required and the cure continued as previously specified in "Curing Concrete."

Finishing work shall not interrupt the curing period unless permitted by the Engineer. The curing period may be extended to provide the minimum total number of days required.

Concrete surface finishes shall be classified as follows:

- (a) **Float Finish:** This finish shall be achieved by placing an excess of material in the form and removing or striking off of such excess forcing the coarse aggregate below the mortar surface. Concave surfaces in which water will be retained will not be allowed. After the concrete has been struck off, the surface shall be thoroughly worked and floated. Before this last finish has set, the surface shall be lightly stripped with a fine brush to remove the surface cement film, leaving a fine-grained, smooth, but sanded texture. Curing, as specified elsewhere, shall follow. Any surfaces that will support appurtenances such as light standards, railing, or fences shall be finished in accordance with 6.01.03-8, "Bearing Surfaces."
- (b) **Rubbed Finish:** The initial rubbing shall only be allowed within three (3) days after placement. The entire surface shall be thoroughly wet with a brush and rubbed with a No. 16 Carborundum Stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth, dense surface without pits or irregularities. The paste formed by the rubbing may be finished by stripping with a clean brush, or it may be spread uniformly over the surface and allowed to re-set. If all or portions of the rubbed surface are unacceptable to the Engineer or a rubbed finish is not provided within three (3) days after removal of forms, the Contractor will be directed to provide a grout clean down finish.
- (c) **Grout Clean-Down Finish:** As soon as all cavities have been filled as required elsewhere and the cement mortar has set sufficiently, grout clean-down shall be performed. All burrs, unevenness, laitance, including that in air holes, and any other material which will adversely affect the bond of the grout to the concrete, shall be removed by acceptable methods. This cleaning shall be done from the top or uppermost part of the surface to be finished to the bottom.

A mixture of a fine aggregate and Portland cement shall be thoroughly blended while dry. The proportions shall be such that when mixed with the proper amount of water, the color will match that of the concrete to be finished. Water shall be added to this mixture in an amount which will bring the grout to a workable thick paint-like consistency.

The surface to be treated shall be thoroughly wetted with a sufficient amount of water to prevent the absorption of water from the grout. Grout shall then be applied to the wetted surface before setting of the grout occurs. Grout which has set shall not be re-tempered and shall be disposed of by the Contractor at no cost to the State.

The grout shall be uniformly applied over the entire surface, completely filling all air bubbles and holes. Immediately after applying the grout, the surface shall be floated with a suitable float, scouring the surface vigorously. While the grout is still plastic, all excess grout shall be removed.

After the final rubbing is completed and the surface has dried, it shall be rubbed to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks. Wetting, application and removal of excess grout shall be completed in one (1) work shift.

All finished surfaces shall be cured for a minimum of twenty-four (24) hours. Horizontal surfaces shall have a float finish and vertical exposed surfaces shall have a rubbed finish. A grout clean down finish may be substituted for a rubbed finish as noted in this section or as directed by the Engineer

11. Mortar, Grout, Epoxy and Joint Seal

- (a) Mortar and Grout:** This work consists of the making and placing of mortar and grout. At least forty-eight (48) hours prior to the planned use, a copy of the installation instructions and MSDS sheet(s) shall be provided to the Engineer for review and concurrence of their applicability and for verification of proper hole sizes in concrete structures. Such uses include mortar for filling under masonry plates, mortar used to fill voids and repair surface defects, grout used to fill sleeves for anchor bolts, and mortar and grout for other such uses where required or approved.

Concrete areas to be in contact with the mortar or grout shall be cleaned of all loose or foreign material that would in any way prevent bond, and the concrete surfaces shall be flushed with water and allowed to dry until no free-standing water is present.

The mortar or grout shall completely fill and shall be tightly packed into recesses and holes, on surfaces, under structural members, and at other locations specified. After placing, all surfaces of mortar or grout shall be cured as previously specified in 6.01.03-9(a)-2 "Curing Concrete – Water Method," for a period of not less than three (3) days.

- (b) Epoxy:** The epoxy shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. Instructions furnished by the supplier for the safe storage, mixing, handling and

application of the epoxy shall be followed. Contents of damaged or previously opened containers shall not be used.

- (c) Joint Seal:** This work consists of sealing joints where shown on the plans or as otherwise directed by the Engineer.

Before placement of the sealing material, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust or other foreign matter. Projections of concrete into the joint space shall be removed. The joint shall be clean and dry before the sealing compound is applied.

The joint sealant shall be prepared and placed in accordance with the manufacturer's directions and with the equipment prescribed by the manufacturer. The sealing compound shall be flush with, or not more than 1/8 inch (3 mm) above the adjacent surface of concrete, cutting off all excess compounds after the application. The joints shall be sealed in a neat and workmanlike manner and when the work is completed, the joints shall effectively seal against infiltration of moisture and water.

The Contractor shall arrange for, and have present at the commencement of the joint-sealing operation, a technically competent manufacturer's representative knowledgeable in the methods of installation of the sealant. The Contractor shall also arrange to have the representative present at such other times as the Engineer may request.

- (d) **Closed Cell Elastomer:** The closed cell elastomer shall be of the thickness, size and type specified and installed as shown on the plans and shall be in accordance with Section M.03.

12. Application of Loads: Loads shall not be applied to concrete structures until the concrete has attained sufficient strength and, when applicable, sufficient pre-stressing and post tensioning has been completed, so that damage will not occur. The means to determine when the concrete has attained sufficient strength shall be the use of Progression cylinders as defined elsewhere in this specification, or other means approved in advance by the Engineer.

- (a) **Earth Loads:** The placement of backfill shall not begin until the concrete is cured and has reached at least eighty percent (80%) of its specified strength unless otherwise permitted by the Engineer. The sequence of placing backfill around structures shall minimize overturning or sliding forces and flexural stresses in the concrete.
- (b) **Construction Loads:** Light materials and equipment may be hand carried onto bridge decks only after the concrete has been in place at least twenty-four (24) hours providing curing is not interfered with and the surface texture is not damaged.

Prior to the concrete achieving its specified compressive strength, any other live or dead loads imposed on existing, new, or partially completed portions of structures, shall not exceed the reduced load carrying capacity of the structure, or portion of structure. The Contractor may be required to submit calculations to the Engineer

that verify these requirements are being met. The compressive strength of concrete ($f'c$) to be used in computing the load-carrying capacity shall be the smaller of the actual field compressive strength at the time of loading or the specified design strength of the concrete. The means to determine the actual field compressive strength shall be approved by the Engineer.

For post-tensioned structures, no live or dead loads shall be allowed on any span until the steel for that span has been tensioned.

- (c) Loading of Completed Elements:** Precast concrete or steel girders shall not be placed on substructure elements until the substructure concrete has attained eighty-five percent (85%) of its specified strength.

No load shall be allowed on mortar or grout that has been in place less than seventy-two (72) hours.

- (d) Traffic Loads:** The concrete deck will not be opened to traffic until at least fourteen (14) days after the last placement of deck concrete and until such concrete has attained its specified strength.

13. Dispute Resolution: The basis of any dispute resolution is side-by-side and quality control testing by the Contractor or the Contractor's representative. The Contractor and Engineer should perform independent testing on the material to reasonably establish the true characteristics of the material at the time of delivery. Absent of Contractor QC testing, the Engineer's test results will apply to the quantity of concrete represented by the sample, not to exceed 75 cubic yards (60 cubic meters).

- (a) Air Content:** Contractor QC Testing must be performed by personnel qualified by The American Concrete Institute as an ACI Concrete Field Testing Technician Grade 1 or higher and performed in accordance with AASHTO T-23. If the Contractor's test results vary from those of the Engineer, the Contractor shall immediately notify the Engineer of the difference and work cooperatively to determine the reasonable cause and recognize the valid test. Should there be agreement, the result of the valid test will be used for acceptance and adjustment purposes for that lot of material. Should there not be an agreement as to the valid test, an additional set of tests should be performed. Results of all valid tests on the same lot may be averaged and used for acceptance and adjustment purposes. Should the Contractor wish to perform additional QC testing on subsequent material, the lot sizes may be adjusted to the amount of material included in that specific delivery. Any such QC testing must be witnessed and agreed to by the Engineer.

- (b) Compressive Strength:** Contractor QC testing for compressive strength must be performed in accordance with AASHTO T-22 by personnel approved by the Engineer. Samples used to dispute the Engineer's test results must be made simultaneously and from the same batch of concrete. Should the Contractor wish to pursue a dispute resolution with regard to compressive strength, the Contractor shall submit in writing to the Engineer all test results, control charts, or other documentation that may be useful in determining if the specific lot(s) of material met the Contract specifications. The Engineer will consider the submittal and may average specific test results on the disputed lot(s) for acceptance and adjustment purposes. Destructive testing of any kind on the placed concrete structure will not be allowed.

6.01.04—Method of Measurement: This work will be measured for payment as follows:

1. Concrete: The quantity of concrete will be the actual volume in cubic yards (cubic meters) of the specified class or classes, with the exception of underwater concrete, completed and accepted within the neat lines as shown on the plans or as ordered by the Engineer.

When concrete is placed against bedrock, a maximum of 6 additional inches (150 additional millimeters) beyond the neat lines can be measured for payment.

No deduction will be made for panels, form liners, reinforcing bars, structural steel shapes or for pile heads. There will be no deduction made for the volume occupied by culvert and drainage pipes, scuppers, weep holes, public utility structures or any other opening, unless the surface area of any such single opening is 9 square feet (1 square meter) or more.

In the case of culverts or drainage pipes, the computation of the surface area will be based on the nominal diameter of the pipe, disregarding the thickness of the shell.

Miscellaneous materials necessary for completion of the work such as felt, mortar, grout, epoxy, joint seal, paraffin coating and closed cell elastomer will not be measured for payment.

Incidental work such as forming for anchor bolts, utilities, keyways, and sampling and testing will not be measured for payment.

2. Underwater Concrete: When underwater concrete is used, it will be measured by the volume in cubic yards (cubic meters) within the actual horizontal limits of the cofferdam and between the elevations established by the Engineer.

3. Joint Filler: This material will be measured by the area in square feet (square meters) of the joint filler, of the type and thickness specified, actually installed and accepted.

6.01.05—Basis of Payment: Payment for this work will be made as follows:

1. Concrete: Progress payments may be allowed for completed major labor elements of work such as forming, placing and curing. Prior to placement, the Contractor shall submit a proposed schedule of values for review and approval by the Engineer.

Payment for any lot of concrete allowed to remain in place will be adjusted when the field and laboratory testing of the material is completed. The quantity of concrete in each lot will be a maximum of 75 cubic yards (60 cubic meters). Payment for each lot of concrete will be adjusted based on the results of the Acceptance testing performed by the Engineer.

The following pay factors apply for Standard and Modified Standard Mix classes with regard to entrained air content:

Air Pay Factors

Measured air (%)		Pay factor (%)
4.5 to 7.5		1.00 (100)
4.3 and 4.4	7.6 and 7.7	0.98 (98)
4.1 and 4.2	7.8 and 7.9	0.96 (96)
3.9 and 4.0	8.0 and 8.1	0.94 (94)
3.7 and 3.8	8.2 and 8.3	0.92 (92)
3.5 and 3.6	8.4 and 8.5	0.90 (90)
Concrete lots with less than 3.5% or greater than 8.5% entrained air will be rejected.		

The following pay factors apply for Standard and Modified Standard Mix classes with regard to compressive strength:

Strength Pay Factors

Compressive Strength (%)	Pay factor (%)
95 or greater	1.00 (100)
90 to 94.9	0.95 (95)
85 to 89.9	0.90 (90)
Concrete lots with less than 85% specified strength will be rejected.	

The payment adjustment value for entrained air and 28-day strength for any lot of concrete that is allowed to remain in-place is determined using the formulas below. An index price of \$400.00 per c.y. (cu.m) shall be used to calculate each adjustment. The total adjustment value will be the sum of each individual adjustment value and will be deducted from the payment for the appropriate item.

English Units:	Metric Units:
Adjustment (air) = (1 - air pay factor) x \$400/c.y. x lot size (c.y.)	Adjustment (air) = (1 - air pay factor) x \$400/cu.m x lot size (cu.m)
Adjustment (strength) = (1 - strength pay factor) x \$400/c.y. x lot size (c.y.)	Adjustment (strength) = (1 - strength pay factor) x \$400/cu.m x lot size (cu.m)
Total Adjustment = Adjustment (air) + Adjustment (strength)	

The Contractor shall request permission from the Engineer to remove and replace a lot(s) of concrete to avoid a negatively adjusted payment. Any replacement material will be sampled, tested and evaluated in accordance with this specification.

No direct payment will be made for any labor, equipment or materials used during the sampling and testing of the concrete for Progression or Acceptance. The cost shall be considered as included in the general cost of the work or as stated elsewhere in the Contract. The work of transporting the concrete test specimens, after initial curing, for Acceptance testing will be performed by the Department without expense to the Contractor.

This material will be paid for at the Contract unit price per cubic yard (cubic meter) less any adjustments, for the specified class or classes, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto, including heating, all admixtures, joint sealer, roofing felt and closed cell elastomer, and any miscellaneous materials such as metal flashing and metal used in expansion joints and bearings.

2. Underwater Concrete: When this class of concrete is used, it will be paid for at the Contract unit price per cubic yard (cubic meter) for "Underwater Concrete," complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

3. Joint Filler: Expansion joint filler will be paid for at the Contract unit price per square foot (square meter) for "Joint Filler for Bridges" of the type and thickness specified, complete in place, which price shall include all materials, equipment, tools, labor and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete (Class A, C, F)	c.y. (cu.m)
Underwater Concrete	c.y. (cu.m)
Joint Filler for Bridges (Thickness and Type)	s.f. (s.m.)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 6.03
STRUCTURAL STEEL**

Delete the entire section and replace it with the following:

**SECTION 6.03
STRUCTURAL STEEL**

6.03.01—Description: Work under this item shall consist of furnishing, fabricating, transporting, storing, handling and erecting of structural steel of the type and size designated, as shown on the plans, as directed by the Engineer and in accordance with these Specifications.

All work except as stated in the following paragraph shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications and the ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

All work subject to railroad loading shall conform to AREMA and the ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

6.03.02—Materials: The materials for this work shall conform to the requirements of Section M.06.

Materials for this work shall be stored off the ground before, during, and after fabrication. It shall be kept free from dirt, grease and other contaminants and shall be reasonably protected from corrosion. In addition, weathering steel shall be stored as to allow free drainage and promote the development of the oxide coating and a uniform appearance.

6.03.03—Construction Methods:

1. Pre-qualification:

(a) Fabricators producing material for Department projects under this item are required to have as a minimum, an active AISC Certification for Simple Steel Bridges. For fabrication of material for use on bridges other than un-spliced rolled beam bridges, AISC Major Steel Bridge Certification is required. If so noted on the plans, additional AISC endorsement for fabrication of fracture critical members is also required.

(b) Field Welders: Prior to working on material for Department projects under this Specification, all field welders, field welding operators, and field tackers must possess a valid welder certification card issued by the Department's Division of

Materials Testing. If such person has not been engaged in welding operations on a Department project or project acceptable to the Department within a period of six (6) months, or cannot produce an approved welding certificate dated within the previous twelve (12) months from a welding agency acceptable to the Engineer, the field welder shall be required to re-qualify through examination. The Engineer may require re-qualification of anyone whose quality of work is in question.

2. Submittals:

(a) Shop Drawings: Prior to any fabrication, the Contractor shall submit shop drawings in accordance with Article 1.05.02 to the Engineer for review. Shop drawings shall include a cambering procedure and diagram. In the case of trusses, the Contractor is responsible for calculation of the camber (lengthening and shortening) of all truss members.

(b) Shop Schedule: The Contractor shall submit a detailed shop fabrication schedule to the Engineer for review within 30 days of the Notice to Proceed unless otherwise agreed to by the Engineer. At a minimum the schedule shall include the start date, milestone dates, and completion date. Any significant changes shall be brought to the attention of the Engineer immediately.

(c) Welding Procedures: Prior to start of fabrication, all welding procedures shall be submitted to the Engineer for review.

(d) Working Drawings for Falsework and Erection of Structural Steel: Prior to erecting any steel fabricated under this Specification, the Contractor shall submit drawings and supporting calculations, including erection stresses, in accordance with Article 1.05.02 to the Engineer. The design of temporary supports and falsework shall conform to the *AASHTO Specifications*, the *AASHTO Guide Design Specifications for Bridge Temporary Works* or any other standard acceptable to the Engineer. Falsework shall be of sufficient rigidity and strength to safely support all loads imposed and to produce in the finished structure the lines and grades indicated in the Contract.

The working drawings submittal shall include at a minimum:

- Title block with Contract number, Project identification number (PIN), town, and structure number and name.
- Plan of the work area showing support structures, roads, railroad tracks, Federal and State regulated areas as depicted on the plans, utilities or any other information relative to erection.
- A detailed narrative describing the erection sequence for main members and secondary members (cross frames, diaphragms, lateral bracing, portals, etc.), noting use of holding cranes or temporary supports, falsework, or bents.
- Delivery location of each girder.
- Location of each crane for each pick.
- Capacity chart for each crane and boom length used in the work.
- The capacity of the crane and of all lifting and connecting devices shall be adequate for the total pick load including spreaders and other materials. In the area of railroads and navigable waterways, the capacity shall be as

required by Amtrak, Metro North, U.S. Coast Guard or other regulatory authorities. No picks shall be allowed over vehicular or pedestrian traffic unless otherwise noted on the plans or permitted by the Engineer.

- Pick point location(s) on each member.
- Lifting weight of each member including clamps, spreader beams, etc.
- Lift and setting radius for each pick (or maximum lift radius).
- Description of lifting devices or other connecting equipment.
- Girder tie-down details or other method of stabilizing erected girders.
- Bolting requirements, including the minimum number of bolts and erection pins required to stabilize members during the erection sequence.
- Blocking details for stabilizing members supported on expansion bearings and on bearings that do not limit movement in the transverse direction.
- The method and location for temporary supports for field spliced or curved girders, including shoring, false work, holding cranes, guys, etc. The Engineer will review, but not approve details of temporary supports. The design, erection, and stability of these supports shall be the sole responsibility of the Contractor.
- Offsets necessary to adjust expansion bearings during erection to provide for temperature variance and dead load rotation.

The following notes shall be placed on the Erection Drawings:

- Cranes shall be operated in accordance with the Connecticut Department of Public Safety regulations.
- The Contractor shall be responsible for verifying the weight of each lift and for insuring the stability of each member during all phases of erection.
- Members shall be subject to only light drifting to align holes. Any drifting that results in distortion of the member or damage to the holes will be cause for rejection of the member.
- Field reaming of holes shall not be performed unless required by the Contract Drawings or approved by the Engineer.

The Contractor shall submit these documents to the Engineer at least sixty (60) calendar days in advance of their proposed use. If the proposed method of erection requires additional members or modifications to the existing members of the structure, such additions and modifications shall be made by the Contractor at no expense to the State.

3. Shop Fabrication: Unless otherwise shown on the plans or indicated in the Special Provisions, Structural Steel shall be fabricated in accordance with the AASHTO LRFD Bridge Construction Specifications, amended as follows:

(a) Notification: The Contractor shall submit written notification to both the Engineer and the Division Chief (OOC) not less than thirty (30) calendar days prior to start of fabrication. No material shall be manufactured or worked in the shop before the Engineer has been so notified. The notification shall include the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of a Department Quality Assurance inspector.

(b) Camber: All members shall be cambered prior to heat curving and painting. Rolled beams shall be heat cambered by methods approved by the Engineer. Plate girders shall be cambered by cutting the web to the prescribed shape with allowances for shrinkage due to cutting, welding, and heat curving. The fabricator is responsible to determine what allowances should be made. Rolled, plate-rolled, or fabricated sections shall be cambered to the total amount shown on the plans and within the camber deviation tolerances permitted for welded beams and girders, as indicated in the ANSI/AASHTO/AWS D1.5 Bridge Welding Code. The Contractor must submit to the Engineer for approval, a plan for corrective action if the actual camber is not within tolerance.

(c) Welding: Unless otherwise indicated in the Contract, all work shall be performed in accordance with ANSI/AASHTO/AWS D1.5 – Bridge Welding Code.

(d) Preassembly of Field Connections: Field connections of main members of continuous beams, plate girders, bents, towers, rigid frames, trusses and arches shall be preassembled prior to erection as necessary to verify the geometry of the completed structure or unit and to verify or prepare field splices. The Contractor shall propose an appropriate method of preassembly for review and comment by the Engineer. The method and details of preassembly shall be consistent with the erection procedures shown on the working drawings and camber diagrams. As a minimum, the preassembly procedure shall consist of assembling three (3) contiguous panels accurately adjusted for line and camber. Successive assemblies shall consist of at least one (1) section or panel of the previous assembly plus two (2) or more sections or panels added at the advancing end. In the case of structures longer than 150 feet (45 meters), each assembly shall not be less than 150 feet (45 meters) long regardless of the length of individual continuous panels or section. All falsework, tools, machinery and appliances, including drift pins and bolts necessary for the expeditious handling of the work shall be provided by the Contractor at no cost to the State.

(e) Inspection: The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide Quality Assurance (QA) inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the Project, each individual piece of structural steel shall be stamped or marked in a clear and permanent fashion by a representative of the fabricator's Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the Project specifications for that piece. The stamp or mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a

single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the Project Site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of structural steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be stamped or marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the Project Site. Such marking does not indicate acceptance or approval of the material by the Engineer.

Following delivery to the Project Site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the Project Site.

(f) Nondestructive Testing: All nondestructive testing of structural steel and welding shall be performed as designated in the plans and specifications. Such testing shall be performed by personnel approved by the Engineer.

Personnel performing Radiographic, Ultrasonic or Magnetic Particle testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A.

Nondestructive testing shall be performed in accordance with the procedures and standards set forth in the AASHTO/AWS D1.5, Bridge Welding Code. The Department reserves the right to perform additional testing as determined by the Engineer.

All nondestructive testing shall be witnessed by an authorized representative of the Department. Certified reports of all tests shall be submitted to the Division of Materials Testing for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

Should the Engineer require nondestructive testing on welds not designated in the Contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld is defective. If the testing indicates the weld to be satisfactory, the actual cost of such inspection will be paid for by the Department.

(g) Marking: Each member shall be identified with an erection mark corresponding with the member identification mark on the approved shop drawings. Identification marks shall be impressed into the member with a low stress stamp in a location in accordance with standard industry practice.

(h) Shipping, Handling, Storage and Receiving: The Contractor shall make all arrangements necessary to properly load, transport, unload, handle and store all material. The Contractor shall furnish to the Engineer copies of all shipping statements. The weight (mass) of the individual members shall be shown on the statements. Members having a weight (mass) of more than 3 tons (2700 kilograms) shall have the weight (mass) marked thereon. All material shall be unloaded promptly upon delivery. The Contractor shall be responsible for any demurrage charges. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the Project Site. Top lateral bracing shall be installed in tub girders prior to shipping and erection of the field pieces. All costs associated with any corrective action will be borne by the Contractor.

4. Field Erection: A meeting shall be held on Site prior to any erection of structural steel. The Contractor shall name the person responsible for the steel erection work and provide copies of all crane operator licenses. Proposed equipment, rigging, timetable and methods shall be proposed at this meeting.

(a) Falsework: Any temporary work shall be constructed in conformance with the working drawings. The Contractor shall verify that the quality of materials and work employed are consistent with their design.

All girders shall be stabilized with falsework, temporary braces, or holding cranes until a sufficient number of adjacent girders are erected with all diaphragms and cross frames connected to provide necessary lateral support as shown in the erecting diagrams.

Adjustment shall be provided in the falsework and other temporary supports so that the temporary elevation of the structural steel provided by the falsework is consistent with the deflections that will occur as the structure is completed. The elevation of falsework shall be such as to support the girders at the cambered no-load elevation. Unloading of temporary supports shall be performed such that all temporary supports at each cross section are unloaded uniformly. Unless specifically permitted by the Engineer, welding of falsework support brackets to structural steel is not allowed.

Unless erected by the cantilever method, truss spans shall be erected on blocking. The blocking shall be left in place until the tension chord splices are fully bolted and all other truss connections pinned and bolted and the proper geometric shape is achieved.

(b) Anchorages: Anchor bolts and similar materials which are to be placed during the erection of the structural steel shall be carefully and accurately set to the requirements of Article 6.01.03.

(c) Bearings: Bearing plates shall have a full and uniform bearing upon the substructure masonry. Bearing plates shall be placed upon bearing areas which are finished according to the requirements of Article 6.01.03.

Prefabricated pads conforming to the requirements of Article M.12.01 shall be installed unless specifically noted otherwise in the Contract plans.

Each piece shall be the same size as the bearing plate it is to support and the holes to accommodate the anchor bolts shall be clearly and accurately punched before setting the pad in place.

In placing expansion bearings, due consideration shall be given to the temperature at the time of erection and stage construction requirements. The nuts of anchor bolts at expansion bearings shall be adjusted to permit the free movement of the span.

(d) Field Assembly: Members and components shall be accurately assembled as shown on the plans and any match marks shall be followed. The material shall be carefully handled so that no components will be bent, broken or otherwise damaged.

Hammering which will injure or distort the members is not permitted. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

Cylindrical erection pins shall be 1/32 inch (0.8 mm) larger than the nominal diameter of the holes.

Splices and field connections of main stress carrying members shall be made with a minimum of fifty percent (50%) of the holes filled and tightened with high strength bolts before the lifting system is released. The bolts shall be installed uniformly throughout the connection. Lateral stability must be maintained until the deck is placed.

The Contractor shall ensure that girders are stable throughout the erection process. The stage of completeness of the bolted connections shall be considered when evaluating the strength and stability of the steel during erection. For Closed Box and Tub Girders the Contractor shall ensure that the cross-section shape of each box is maintained during erection. Top lateral bracing shall be installed in tub girders prior to shipping and erection of the field pieces.

(e) Welded Connections: Unless otherwise shown on the plans or indicated by the special provisions, welding of structural steel shall be done in accordance with "ANSI/AASHTO/AWS D1.5 Bridge Welding Code."

The Contractor's welding and inspection procedures for each type of field weld and field tacking must be submitted to the Engineer on the form designated by the Department. All procedures must be approved by the Division of Materials Testing prior to any work and must be adhered to at all times.

Quality control is the responsibility of the Contractor. The Contractor must provide an AWS Certified Welding Inspector (CWI) in accordance with AWS D1.5. The CWI must be qualified and certified in accordance with the provisions of AWS QC1, *Standard for Qualification and Certification of Welding Inspectors*.

The CWI shall make visual inspection of all welds. The Contractor will perform magnetic particle inspection, ultrasonic testing inspection, or radiographic testing inspection of field welds when required in the plans or special provisions. Each test may be witnessed by an authorized representative of the Engineer.

Welds or sections of welds containing imperfections determined to be unacceptable by either the CWI or the Engineer shall be removed and re-welded by the Contractor at their expense. Welds so removed and replaced shall be re-inspected by the CWI. All costs for re-inspection or testing of such welds shall be borne by the Contractor.

(f) High Strength Bolted Connections: The assembly of structural connections using ASTM A 325/ A 325M or ASTM A 490/A 490M high-strength bolts shall be installed so as to develop the minimum required bolt tension specified in Table A. The Manufacturer's certified test report, including the rotational capacity test results, **must** accompany the fastener assemblies. Fastener assemblies delivered without the certified reports will be rejected.

Bolts, nuts and washers from each rotational-capacity lot shall be shipped in the same container. If there is only one production lot number for each size of nut and washer, the nuts and washers may be shipped in separate containers. Each container shall be permanently marked with the rotational-capacity lot number such that identification will be possible at any stage prior to installation. Assemblies of bolts, nuts and washers shall be installed from the same rotational-capacity lot. Pins, small parts and packages of bolts, washers, and nuts shall be shipped in boxes, crates, kegs, or barrels. A list and description of the contained materials shall be plainly marked on the outside of each shipping container.

Bolted Parts: All material within the grip of the bolt shall be steel; there shall be no compressible material, such as gaskets or insulation, within the grip. Bolted steel shall fit solidly together after the bolts are tensioned. The length of the bolts shall be such that the end of the bolt will be flush with or outside of the face of the nut when properly installed.

Surface Conditions: At the time of assembly, all connection surfaces, including surfaces adjacent to the bolt head and nut, shall be free of scale, except tight mill scale, and shall be free of dirt or other foreign material. Burrs that would prevent solid seating of the connected parts in the snug tight condition shall be removed.

Paint is permitted on the faying surface, including slip critical connections, only when shown on the plans. The faying surfaces of slip-critical connections shall meet the requirements of the following paragraphs, as applicable:

- Connections specified to have un-coated faying surfaces: any paint, including any inadvertent over spray, shall be excluded from areas closer than one (1) bolt diameter, but not less than 1.0 in (25 mm), from the edge of any hole and all areas within the bolt pattern.
- Connections specified to have painted faying surfaces shall be blast cleaned and coated in accordance with the Contract, and shall not be assembled until the coating system has been properly cured.
- Connections specified to have galvanized faying surfaces shall be hot-dip galvanized in accordance with ASTM A 123/A 123M, and shall subsequently be roughened by means of hand wire brushing. Power wire brushing is not permitted.

Installation: At the pre-erection meeting, the Contractor shall inform the Engineer of its planned method of tensioning high strength bolts. Acceptable methods are: Turn-of-Nut, Calibrated Wrench or Direct Tension Indicator.

Fastener Assemblies: A "fastener assembly" is defined as a bolt, a nut, and a washer. Only complete fastener assemblies of appropriately assigned lot numbers shall be installed.

Fastener assemblies shall be stored in an area protected from dirt and moisture. Only as many fastener assemblies as are anticipated to be installed and tensioned during a work shift shall be taken from protected storage. Fastener assemblies not used shall be returned to protected storage at the end of the shift. Prior to installation, fastener assemblies shall not be cleaned of lubricant. Fastener assemblies which accumulate rust or dirt resulting from site conditions shall be cleaned, relubricated and tested for rotational-capacity prior to installation. All galvanized nuts shall be lubricated with a lubricant containing a visible dye. Plain bolts must be oily to the touch when delivered and installed. Lubricant shall be removed prior to painting.

All bolts shall have a hardened washer under the turned element (nut or bolt head). All hardened washers shall conform to the requirements of ASTM F 436/F 436M.

Where necessary, washers may be clipped on one side to a point not closer than 7/8 of the bolt diameter from the center of the washer. Circular and beveled washers, when used adjacent to direct tension indicator washers shall not be clipped. Direct tension indicator washers shall not be clipped.

Bolt Tension Measuring Device: The Contractor shall provide a calibrated bolt tension measuring device (a Skidmore-Wilhelm calibrator (Skidmore) or other acceptable bolt tension indicating device) at all times when, and at all locations where high-strength fasteners are being installed and tensioned. The tension measuring device (Skidmore) shall be calibrated by an approved testing agency at least annually. The Skidmore shall be used to perform the rotational-capacity test of the fastener assemblies. The Skidmore will also be used to substantiate (1) the suitability of the fastener assembly to satisfy the requirements of Table A, including

lubrication as required, (2) calibration of the installation wrenches, if applicable, and (3) the understanding and proper use by the Contractor of the selected method of tensioning to be used.

Complete fastener assemblies shall be installed in properly aligned holes and then tensioned by the Turn-of-Nut, Calibrated Wrench or Direct Tension Indicator method to the minimum tension specified in Table A. Tensioning may be done by turning the bolt while the nut is prevented from rotating when it is impractical to turn the nut. Impact wrenches, if used, shall be of adequate capacity and sufficiently supplied with air to perform the required tensioning of each bolt in approximately ten (10) seconds.

Bolts shall be installed in all holes of the connection and the connection brought to a snug condition. Snug is defined as having all the plies of the connection in firm contact. Snugging shall progress systematically from the most rigid part of the connection to the free edges. The bolts of the connection shall then be tightened in a similar manner as necessary until the connection is properly tensioned.

Nuts shall be located, whenever practical, on the side of the connection which will not be visible from the traveled way.

Unless otherwise approved by the Engineer fastener assemblies shall be brought to full tension immediately following snugging.

Fully tensioned fastener assemblies shall not be reused. Retightening previously tensioned bolts which may have been loosened by the tensioning of adjacent bolts shall not be considered as reuse.

Rotational-Capacity Tests: In addition to the certified test reports, on site Rotational-capacity tests may be required by the Engineer. This test shall be performed by the Contractor at the location where the fasteners are installed and tensioned. When performed in the field, the procedure shall conform to the requirements of ASTM A 325/ A 325M Appendix A-1.

Turn-of-Nut Installation Method: At the start of the work, the Contractor shall demonstrate that the procedure used by the bolting crew to develop a snug condition and to control the turns from a snug condition develops the tension required in Table A. To verify their procedure, the Contractor shall test a representative sample of not less than three complete fastener assemblies of each diameter, length and grade to be used in the work. This shall be performed at the start of work using a Skidmore. Periodic retesting shall be performed when ordered by the Engineer.

After snugging the connection, the applicable amount of rotation specified in Table B shall be achieved. During the tensioning operation there shall be no rotation of the part not turned by the wrench. Tensioning shall progress systematically from the most rigid part of the connection to its free edges.

Calibrated Wrench Installation Method: Calibrated wrench method may be used only when the installation wrenches are properly calibrated daily, or as determined by

the Engineer. Standard torques determined from tables or from formulas which are assumed to relate torque to tension **shall not** be acceptable.

The Contractor shall demonstrate to the Engineer periodically that all equipment and wrenches are providing a torque which has been calibrated to produce the minimum tension specified in Table A. The installation procedures shall be verified periodically, as determined by the Engineer, for each bolt diameter, length and grade using the fastener assemblies that are being installed in the work. This verification testing shall be accomplished in a Skidmore by tensioning three (3) complete fastener assemblies of each diameter, length and grade from those being installed with a hardened washer under the element turned.

When significant difference is noted in the surface condition of the bolts, threads, nuts or washers, as determined by the Engineer, wrenches shall be recalibrated. The Contractor shall verify during the installation of the assembled steel work that the wrench adjustment selected by the calibration does not produce a nut or bolt head rotation from snug greater than that permitted in Table B. If manual torque wrenches are used, nuts shall be turned in the tensioning direction when torque is measured.

When calibrated wrenches are used to install and tension bolts in a connection, bolts shall be installed with hardened washers under the element turned to tension the bolts. Once the connection has been snugged, the bolts shall be tensioned using the calibrated wrench. Tensioning shall progress systematically from the most rigid part of the connection to its free edges. A calibrated torque wrench shall be used to "touch up" previously tensioned bolts which may have been relaxed as a result of the subsequent tensioning of adjacent bolts until all bolts are tensioned to the prescribed amount.

Direct Tension Indicator Installation Method: When Direct Tension Indicators (DTIs) meeting the requirements of Section M.06 are used with high-strength bolts to indicate bolt tension, they shall be subjected to the verification testing described below and installed in accordance with the method specified below. Unless otherwise approved by the Engineer, the DTIs shall be installed under the head of the bolt and the nut turned to tension the bolt. The Manufacturer's recommendations shall be followed for the proper orientation of the DTI and additional washers, if any, required for the correct use of the DTI. Installation of a DTI under the turned element may be permitted if a washer is used to separate the turned element from the DTI.

Verification: Verification testing shall be performed in a Skidmore. A special flat insert shall be used in place of the normal bolt head holding insert. Three verification tests shall be required for each combination of fastener assembly rotational-capacity lot, DTI lot, and DTI position relative to the turned element (bolt head or nut) to be used on the Project. The fastener assembly shall be installed in the tension-measuring device with the DTI located in the same position as in the work. The element intended to be stationary (bolt or nut) shall be restrained from rotation.

The verification tests shall be conducted in two stages. The bolt nut and DTI assembly shall be installed in a manner so that at least three (3) and preferably not more than five (5) threads are located between the bearing face of the nut and the bolt head. The bolt shall be tensioned first to the load equal to that listed in Table C under Verification Tension for the grade and diameter of the bolt. If an impact wrench is used, the tension developed using the impact wrench shall be no more than two-thirds (2/3) of the required tension. Subsequently, a manual wrench shall be used to attain the required tension. The number of refusals of the 0.005 in (0.125 mm) tapered feeler gage in the spaces between the protrusions shall be recorded. The number of refusals for uncoated DTIs under the stationary or turned element, or coated DTIs under the stationary element, shall not exceed the number listed under Maximum Verification Refusals in Table C for the grade and diameter of bolt used. The maximum number of verification refusals for coated DTIs (galvanized, painted, or epoxy-coated), when used under the turned element, shall be no more than the number of spaces on the DTI less one. The DTI lot shall be rejected if the number of refusals exceeds the values in the table or, for coated DTIs if the gage is refused in all spaces.

After the number of refusals is recorded at the verification load, the bolt shall be further tensioned until the 0.005 in (0.125 mm) feeler gage is refused at all the spaces and a visible gap exists in at least one space. The load at this condition shall be recorded and the bolt removed from the tension-measuring device. The nut shall be able to be run down by hand for the complete thread length of the bolt excluding thread run-out. If the nut cannot be run down for this thread length, the DTI lot shall be rejected unless the load recorded is less than ninety-five percent (95%) of the average load measured in the rotational capacity test of the fastener lot as specified previously in "Rotational-Capacity Tests."

If the bolt is too short to be tested in the calibration device, the DTI lot shall be verified on a long bolt in a calibrator to determine the number of refusals at the verification tension listed in Table C. The number of refusals shall not exceed the values listed under maximum verification refusals in Table C. Another DTI from the same lot shall then be verified with the short bolt in a convenient hole in the work. The bolt shall be tensioned until the 0.005 in. (0.125 mm) feeler gage is refused in all spaces and a visible gap exists in at least one space. The bolt shall then be removed from the tension-measuring device and the nut shall be able to be run down by hand for the complete thread length of the bolt excluding thread run-out. The DTI lot shall be rejected if the nut cannot be run down this thread length.

Installation: Installation of fastener assemblies using DTIs shall be performed in two stages. The stationary element shall be held against rotation during each stage of the installation. The connection shall be first snugged with bolts installed in all holes of the connection and tensioned sufficiently to bring all the plies of the connection into firm contact. The number of spaces in which a 0.005 in (0.125 mm) feeler gage is refused in the DTI after snugging shall not exceed those listed under Maximum Verification Refusals in Table C. If the number exceeds the values in the table, the fastener assembly shall be removed and another DTI installed and snugged.

For uncoated DTIs used under a stationary or turned element and for coated DTIs used under a stationary element, the bolts shall be further tensioned until the number of refusals of the 0.005 in. (0.125 mm) feeler gage shall be equal or greater than the number listed under Minimum Installation Refusals in Table C. If the bolt is tensioned so that no visible gap in any space remains, the bolt and DTI shall be removed and replaced by a new properly tensioned bolt and DTI.

When coated DTIs (galvanized, painted or epoxy coated) are used under a turned element, the 0.005 in (0.125 mm) feeler gage shall be refused in all spaces.

Inspection: The Contractor shall provide all the material, equipment, tools and labor necessary for the inspection of the bolted connections. Access to the bolted parts and fastener assemblies, both before and after the fasteners are installed and tensioned, shall be provided.

The Contractor is responsible for Quality Control (QC). The Contractor shall review this Specification with its project personnel prior to performing the work. The Contractor shall verify the proper markings, surface conditions and storage of fastener assemblies. The Contractor shall inspect the faying surfaces of connections for compliance with the plans and specifications. The Contractor shall provide to the Engineer a copy of their written QC Report for each shift of the calibration or verification testing specified. This Report shall confirm that the selected procedure is properly used and that the fastener assemblies installed meet the tensions specified in Table A. The Contractor shall monitor the installation of fasteners in the work to assure that the selected procedure, as demonstrated in the initial testing to provide the specified tension, is routinely and properly applied.

The Contractor, in the presence of the Engineer, shall inspect the tensioned bolts using an inspection torque wrench, as defined below. If DTI devices are used, the appropriate feeler gauge will be used. Inspection tests shall be performed within 24 hours of bolt tensioning to prevent possible loss of lubrication or corrosion influence on tensioning torque.

The inspection torque wrench shall be calibrated as follows: Three (3) bolts of the same grade, size, and condition as those under inspection shall be placed individually in a device calibrated to measure bolt tension. This calibration operation shall be done at least once each inspection day. There shall be a washer under the part turned in torqueing each bolt. In the calibrated device, each bolt shall be tightened by any convenient means to the specified tension. The inspection wrench shall then be applied to the tensioned bolt to determine the torque required to turn the nut or head five degrees (5°) in the tightening direction. The average of the torque required for all three (3) bolts shall be defined as the job-inspection torque.

Twenty-five percent (25%), but a minimum of two (2), of the tensioned bolts shall be selected by the Engineer for inspection in each connection. (The Engineer may reduce the number of bolts tested at a connection to ten percent (10%) based on the Contractor's past performance and splice location.) The job-inspection torque shall then be applied to each selected assembly with the inspection torque wrench turned in the tightening direction. If all inspected bolt heads or nuts do not turn, the bolts in

the tightening direction. If all inspected bolt heads or nuts do not turn, the bolts in the connection shall be considered to be properly tensioned. If the torque turns one or more bolt heads or nuts, the job-inspection torque shall then be applied to **all** bolts in the connection or to the satisfaction of the Engineer. Any bolt whose head or nut turns shall be re-tensioned and re-inspected. The Contractor may, however, re-tension all the bolts in the connection with the inspection torque wrench and resubmit it for inspection, so long as the bolts are not over-tensioned or damaged by this action.

(g) Field Corrections and Misfits: Reaming of bolt holes during erection shall be permitted only with approval of the Engineer. No excessive forces shall be applied to any member to provide for proper alignment of the bolt holes.

The correction of minor misfits involving minor amounts of reaming, cutting, grinding and chipping shall be considered a legitimate part of the erection. However, any error in the shop fabrication or deformation resulting from handling and transportation may be cause for rejection. The Contractor shall be responsible for all misfits, errors and damage and shall make the necessary corrections and replacements.

Table A (English)
Minimum Bolt Tension in kips*

Bolt Size (Inches)	ASTM A 325	ASTM A 490
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1 1/8	56	80
1 1/4	71	102
1 3/8	85	121
1 1/2	103	148

*Equal to 70% of specified minimum tensile strength of bolts (as specified in ASTM Specifications for tests of full-size A 325 and A 490 bolts with UNC threads, loaded in axial tension) rounded to the nearest kip.

TABLE A (Metric)
Minimum Bolt Tension in Kilonewtons*

Bolt Size	ASTM A 325M	ASTM A 490M
M16	91	114
M20	142	179
M22	176	221
M24	205	257
M27	267	334
M30	326	408
M36	475	595

*Equal to 70% of specified minimum tensile strength of bolts (as specified in ASTM Specifications for tests of full-size A 325M and A 490M bolts with metric coarse threads series ANSI B1.13M, loaded in axial tension) rounded to the nearest kilonewton.

TABLE B (English and Metric)
Nut Rotation from the Snug Condition
Geometry^{a,b,c} of Outer Faces of Bolted Parts

Bolt Length (measured from underside of head to end of bolt)	Both Faces Normal to Bolt Axis	One Face Normal to Bolt Axis and Other Face Sloped Not More Than 1:20, Bevel Washer Not Used	Both Faces Sloped Not More Than 1:20 From Normal to Bolt Axis, Bevel Washer Not Used
Up to and including 4 diameters	1/3 turn	1/2 turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	1/2 turn	2/3 turn	5/6 turn
Over 8 diameters but not exceeding 12 diameters	2/3 turn	5/6 turn	1 turn

- (a) Nut rotation, as used in Table B, shall be taken as relative to the bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance should be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance should be plus or minus 45 degrees.

To determine the nut rotation for installation and inspection of the fasteners, the nut and the end of the bolt or the head of the bolt and the adjacent steel shall be match marked.

- (b) The values, given in Table B, shall be applicable only to connections in which all material within grip of the bolt is steel.
- (c) No research work has been performed by the Research Council on Riveted and Bolted Structural Joints to establish the turn-of-nut procedure when bolt lengths exceed 12 diameters. For situations in which the bolt length, measured from the underside of the head to the end of the bolt, exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.

TABLE C (English)

Bolt Dia. (in.)	Verification Tension		Maximum Verification Refusals		DTI Spaces		Minimum Installation Refusals	
	A325	A490	325	490	325	490	325	490
5/8	20	25	1	2	4	5	2	3
¾	29	37	2	2	5	6	3	3
7/8	41	51	2	2	5	6	3	3
1	54	67	2	3	6	7	3	4
1 1/8	59	84	2	3	6	7	3	4
1¼	75	107	3	3	7	8	4	4
1 3/8	89	127	3	3	7	8	4	4
1½	108	155	3	4	8	9	4	5

TABLE C (Metric)

Bolt Dia. (in.)	Verification Tension		Maximum Verification Refusals		DTI Spaces		Minimum Installation Refusals	
	A325	A490	Type 8.8	Type 10.9	Type 8.8	Type 10.9	Type 8.8	Type 10.9
M16	96	120	1	1	4	4	2	2
M20	149	188	2	2	5	6	3	3
M22	185	232	2	2	5	6	3	3
M24	215	270	2	2	5	6	3	3
M27	280	351	2	3	6	7	3	4
M30	342	428	3	3	7	8	4	4
M36	499	625	3	4	8	9	4	5

6.03.04—Method of Measurement: Payment under this item will be at the Contract lump sum price per each complete bridge structure or shall be based on the net weight (mass) of metal in the fabricated structure, whichever method appears on the bid proposal form.

When payment is on a lump sum basis, the work, including anchor bolts, steel bearings and plates will not be measured for payment. Bearing plates welded to the girder are included in the price of the structural steel and bearing plates bonded to the bearings are included in the price of the bearing.

When payment is based on the net weight (mass) of metal in the fabricated structure, it shall be computed as described below.

The weight (mass) of the metal works to be paid for under the item of structural steel shall be computed on the basis of the net finished dimensions of the parts as shown on the shop drawings, deducting for copes, cuts, clips and all open holes, except bolt holes, and on the following basis:

1. The weights (masses) of rolled shapes shall be computed on the basis of their nominal weights (masses) per foot (meter), as shown in the shop drawings or listed in handbooks.

The weight (mass) of plates shall be computed on the basis of the nominal weight (mass) for their width and thickness as shown on the shop drawings.

2. The weight (mass) of temporary erection bolts, shop and field paint, galvanization, boxes, crates and other containers used for shipping, and materials used for supporting members during transportation and erection, shall not be included.

3. The weight (mass) of all high strength bolts, nuts, and washers shall be included on the basis of the following weights (masses):

Weight per 100 pieces			
English units		Metric units	
Nominal diameter of H.S. bolt (inch)	Bolthead, nut, 1 washer and stick through (lbs)	Nominal diameter of H.S. bolt (mm)	Bolthead, nut, 1 washer and stick through (kg)
1/2	22	16	17
5/8	33	20	26
3/4	55	22	39
7/8	84	24	50
1	120	27	60
1 1/8	169	30	73
1 1/4	216	36	122

4. The weight (mass) of weld metal shall be computed on the basis of the theoretical volume from plan dimensions of the welds.

Size of fillet in Inches (mm)	Weight of weld in pounds per foot (kg per meter)
3/16 (5)	0.08 (0.119)
1/4 (6)	0.14 (0.208)
5/16 (8)	0.22 (0.327)
3/8 (9.5)	0.30 (0.446)
1/2 (13)	0.55 (0.818)
5/8 (16)	0.80 (1.190)
3/4 (19)	1.10 (1.636)
7/8 (22)	1.50 (2.231)
1 (25)	2.00 (2.974)

5. The weight (mass) of steel shims, filler plates and anchor bolts shall be measured for payment.

6.03.05—Basis of Payment: The structural steel, incorporated in the completed and accepted structure, will be paid for at the Contract lump sum price for "Structural Steel (Site No.)," or at the Contract unit price per hundredweight (kilogram) for "Structural Steel," whichever is indicated in the Contract.

Payment for either method shall be for structural steel, complete in place, which price shall include quality control, furnishing, fabricating, transporting, storage and handling, erecting, welding, surface preparation and all materials including fastener assemblies, steel bearing assemblies and anchor bolts, equipment, tools and labor incidental thereto.

The cost of the raw material is included in the lump sum payment for "Structural Steel (Site No.)." All remaining work including, but not limited to, preparation of shop drawings, fabricating, transporting, storage and handling, erecting, surface preparation and all materials, equipment, tools and labor incidental thereto, will be paid for under "Structural Steel (Site No.)."

No direct payment will be made for setting anchor bolts, preparing bearing areas, furnishing and placing materials under bearings. No direct payment will be made for non destructive testing as shown on the plans.

<u>Pay Item</u>	<u>Pay Unit</u>
Structural Steel (Site No.)	l.s. (l.s.)
Structural Steel	cwt. (kg)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 6.12
CONCRETE CYLINDER CURING BOX**

Delete the entire section and replace with it the following:

6.12.01 –Description: This item shall consist of furnishing a box for curing concrete test cylinders. The box shall be commercially available and manufactured specifically for curing concrete test cylinders. The box will remain the property of the Contractor at the conclusion of the project. The box shall be delivered to a location on the project as directed by the Engineer.

6.12.02 – Materials: A catalog cut listing detailed specifications of the box and operating instructions from the manufacturer must be submitted to the Engineer. The box and its components shall be constructed of non-corroding materials and shall be capable of storing a minimum of 18 test cylinders, 6" X 12" (152 mm X 305 mm) stored vertically with the lid closed. The lid must be watertight when closed and hinged in the back with security latches on the front that can be padlocked. The box must be capable of holding water to a maximum level of one inch above test cylinders placed in the box vertically. A drain hole must be provided in a wall of the box to allow manual drainage of the water that exceeds this level. A drain hole must also be provided at the bottom of the box so that it can be manually emptied. The temperature of the water must be controlled by heating and cooling device capable of maintaining the temperature of the water within a range of 60 to 80° F, +/- 2 °F (15.5 to 26.7 °C, +/- 1 °C) within an outside ambient air temperature range of -10 to 120 ° F (-23.3 to 49 °C). The heating and cooling device must be positioned to allow free circulation of air and water around the cylinders and be rated at 120 volts and 15 amps. A rack must be provided within the box to support the cylinders above the pool of temperature controlled water. The device must be thermostatically controlled with a digital readout that is capable of displaying the high/low water temperature within the box since the last reading was taken.

6.12.03 - Construction Methods: The Contractor shall maintain the curing box in working order and shall provide all necessary electrical service and water so that the curing box can be used properly during the entire course of the project. Any curing box that is not operating properly, as determined by the Engineer, shall be replaced within 24 hours by the Contractor at no expense to the State. The Engineer reserves the right to prohibit placement of fresh concrete on the project until a curing box acceptable to the Engineer is operational on the project site.

6.12.04 - Method of Measurement: The furnishing of the concrete test cylinder curing box will be measured for payment by the number of boxes delivered by the Contractor and accepted by the Engineer.

6.12.05 – Basis of Payment: This item will be paid for at the contract unit price each for “Concrete Cylinder Curing Box” ordered and accepted on the project, which price shall include all submittals, material, tools, equipment, and labor incidental thereto. The price shall also include all maintenance and operating costs related to the curing box for the duration of the project.

Pay Item	Pay Unit
Concrete Cylinder Curing Box	ea. (ea.)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 6.51
CULVERTS**

6.51.02 – Materials:

Delete the 2nd paragraph, “Pipes of the type indicated ... of Article M.02.01.” and insert the following paragraph:

“Pipes of the type indicated on the plans and joint sealant shall conform to the requirements of Article M.08.01. Bedding material shall conform to the requirements of Article M.08.03. Granular fill shall conform to the requirements of Article M.02.01.”

6.51.03 – Construction Methods:

In the 8th paragraph replace “gravel fill” with “granular fill”.

Delete the 13th paragraph, “Bituminous fiber and ... as the pipe.”

6.51.04 – Methods of Measurement:

In the 7th paragraph, replace “Gravel Fill” with “Granular Fill”.

6.51.05 – Basis of Payment:

In the 8th paragraph, replace “Gravel Fill” with “Granular Fill”.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 7.01
DRILLED SHAFTS**

Add the following section:

**SECTION 7.01
DRILLED SHAFTS**

- 7.01.01 – Description**
- 7.01.02 – Materials**
- 7.01.03 – Construction Methods**
- 7.01.04 – Method of Measurement**
- 7.01.05 – Basis of Payment**

7.01.01 - Description: This work shall consist of all labor, materials, equipment and services necessary to complete the Drilled Shaft installation in accordance with the Contract. Drilled shafts shall be made primarily of reinforced or unreinforced concrete.

7.01.02 - Materials: Drilled Shafts shall be made of the following materials:

1. Portland Cement Concrete: Concrete used in the construction of the shaft shall conform to the plans, Section M.03, and to the following:

- (a)** The concrete shall have a minimum initial slump of 8 in (200 mm).
- (b)** The concrete mix shall maintain a slump of no less than 4 in (100 mm) for a minimum of three (3) hours beyond the expected time for placement of concrete and removal of temporary casing (if used), as indicated by trial mixes and physical tests of slump loss. The trial mix and physical tests (slump loss tests) shall be conducted using concrete mix and ambient air temperatures anticipated during concrete placement.
- (c)** All admixtures, if approved for use, shall be adjusted for the conditions encountered on the job so as to conform to the slump loss requirements within this specification and must not adversely affect the timing of, taking of or interpretation of any Nondestructive Testing that may be called for in the Contract.
- (d)** Coarse aggregate shall conform to Article M.01.01, No. 8 Gradation.

2. Reinforcing Steel: Reinforcing steel used in construction of the shaft shall conform to Article M.06.01.

3. Access Tubes: Access tubes for cross-hole acoustic logging shall be made of Schedule 40 steel pipe conforming to ASTM A 53, Grade A or B, Type E, F, or S. The tubes' inside diameter shall be at least 1.5 in (38 mm). All access tubes, including all pipe joints, shall

have a round, regular inside surface free of defects and obstructions, in order to permit the free, unobstructed passage of probes to the bottoms of the tubes. The access tubes shall be watertight, free from corrosion and free of deleterious material on the outside that could prevent bonding with the concrete. All access tubes shall be fitted with watertight caps on the bottom and top.

4. **Grout:** Grout used for filling Access Tubes shall meet the requirements of Article M.03.05. The grout shall have strength properties equivalent to or better than those of the drilled shaft concrete.
5. **Permanent Casing:** Steel casing shall conform to the requirements of ASTM A36 or A252 Grade 2 unless otherwise specified on the plans. Casings shall be smooth, clean, watertight, and of ample strength to withstand handling, installation, and the pressure from surrounding concrete and earth materials. The outside diameter of any casing shall not be less than the specified diameter of the shaft.

7.01.03 - Construction Methods:

1. **Qualifications of Drilled Shaft Contractor and Submittals:** The Contractor performing the work described in this specification shall have been installing drilled shafts of both diameter and length similar to those shown on the plans for a minimum of three (3) years prior to the bid date for this Project. The Contractor shall submit a list of projects that it has performed in said three (3) years that met these criteria. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects, and that they met said criteria.

As early as possible, and no later than thirty (30) days prior to constructing drilled shafts, the Contractor shall submit to the Engineer an Installation Plan for the shafts. This Plan shall provide the following information:

- (a) A list identifying the intended on-Site supervisor(s) and drill operator(s), for approval by the Engineer. The on-Site supervisor(s) shall have a minimum of two (2) years' experience supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum of one (1) years' experience drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience.

Should the Contractor elect to change any of these intended personnel during construction of the shafts, this same approval process will need to be completed for the new personnel prior to their starting work on the Project. The Contractor shall not be compensated for any delays resulting from such changing of personnel.

- (b) List of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing and any other equipment required for construction of the shafts.

- (c) Details of overall construction operation sequence and the sequence of shaft

construction in bents or groups.

- (d) Details of the Contractor's intended shaft excavation methods.
- (e) When the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the Site, mixing and storage methods, maintenance methods, and disposal procedures.
- (f) Details of methods for cleaning the shaft excavation.
- (g) Details of reinforcement placement, including support and centralization methods.
- (h) Details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory, using approved methods to demonstrate that the concrete meets slump loss requirements.
- (i) Details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates.
- (j) Details of casing installation and removal methods. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.
- (k) Details of methods for removal of obstructions. Obstructions for which the Contractor shall provide details of methods for removal include, but are not necessarily limited to, removal of boulders, concrete, riprap, steel, timber or miscellaneous debris.
- (l) Details for any monitoring plan as called for in the Contract.

The Engineer will evaluate the drilled shaft Installation Plan for conformance with the Contract and will then notify the Contractor of any additional information required or changes necessary in order to meet Contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete Project work as detailed in the plans and specifications. The Contractor shall not commence construction of drilled shafts until the Engineer has approved the Installation Plan.

If integrity or load testing of the drilled shafts is called for by the Contract or the Site conditions, this submittal shall be developed in coordination with and submitted concurrently with working drawing submittals, as required in the testing specifications.

All submittals shall comply with the working drawing submittal requirements outlined in Article 1.05.02.

- 2. Trial Drilled Shaft Installation and Load Testing:** When called for in the Contract, the Contractor shall demonstrate the adequacy of the proposed methods, techniques and equipment by successfully constructing a trial drilled shaft in accordance with these

specifications. This trial drilled shaft shall be positioned away from production shafts, in the location shown on the plans or as directed by the Engineer. The trial shaft shall be drilled to the maximum depth shown in the plans. Failure by the Contractor to demonstrate to the Engineer the adequacy of methods and equipment shall be reason for the Engineer to require alterations of the Contractor's equipment or methods in order to prevent results unacceptable under the Contract or to the Engineer. Any additional trial drilled shaft required to demonstrate the adequacy of altered methods or construction equipment shall be at the Contractor's expense. Once the Engineer approves construction of production shafts, no changes will be permitted in the personnel, materials, methods or equipment used by the Contractor in constructing the satisfactory trial drilled shaft, unless the Contractor obtains the Engineer's written approval to do so.

Unless otherwise shown in the Contract, the trial drilled shaft shall have reinforcing bars, access tubes and concrete placed using the same materials and methods of construction to be used during construction of the production drilled shafts. The trial drilled shaft shall be cut off 2 ft (0.6 m) below finished grade and left in place. The disturbed area(s) at the site(s) of the trial drilled shaft(s) shall be restored as nearly as practical to original conditions.

Should the plans call for load testing of the trial drilled shaft, all necessary loading apparatus, instrumentation and other equipment required for performing the load test will be specified and paid for under a separate item.

All trial drilled shaft(s) and load test(s) must be completed and accepted by the Engineer prior to construction of any production drilled shafts. In the event that there is more than one trial drilled shaft and load test, the Contractor may begin construction of some of the production drilled shafts, in whatever way that the Engineer requires or approves.

- 3. Protection of Existing Structures:** The Contractor shall control drilled shaft operations in a way that will prevent damage to existing structures or utilities, in accordance with Articles 1.07.09 and 1.07.13. Preventive measures shall include, but are not limited to: selecting construction methods and procedures to prevent caving of the shaft excavation, and that will include monitoring and controlling the vibrations from construction activities such as the driving of casing or sheeting, drilling of the shaft, or from any blasting that the Contract or the Engineer may have permitted.

If monitoring is called for in the Contract, a preconstruction survey of existing facilities shall be performed to establish baseline data, including ambient vibration levels and existing structural defects. In general, monumented survey points shall be established on structures which are located within a distance of either ten (10) shaft diameters or the estimated shaft depth, whichever is greater. These points shall be monitored by the Contractor for vertical and lateral movement in an approved manner to the accuracy required by the Engineer.

When deformations exceed the predetermined amount included in the plans, the Contractor shall immediately stop work and, if directed by the Engineer to do so, backfill the excavated hole. The Contractor shall be responsible for selecting and using equipment and procedures that keep deformations of existing structures within levels specified by the Contract or Engineer.

When vibrations are to be monitored, the Contractor must engage the services of a professional vibrations consultant to monitor and record vibration levels during drilled shaft construction. Unless the Engineer states otherwise, vibration monitoring equipment must be capable of detecting velocities of 0.1 in/sec (2.5 mm/sec) or less. When vibration levels exceed tolerable levels established by the Contract or Engineer, the Contractor shall immediately stop the work causing the vibrations and take whatever measures are necessary to reduce vibration levels to below tolerable levels. All costs related to vibration monitoring required in the Contract shall be included in the bid price for the Drilled Shaft item.

- 4. Construction Sequence:** Excavation to footing elevation shall be completed before shaft construction begins unless otherwise noted in the Contract or approved by the Engineer. Any disturbance at or below the footing area caused by shaft installation shall be repaired by the Contractor prior to the footing construction.

When drilled shafts are to be installed in conjunction with embankment placement, the Contractor shall construct drilled shafts after the placement of fills, unless shown otherwise in the Contract or approved by the Engineer.

Drilled shafts, constructed prior to the completion of the fills, shall not be capped until the fills have been placed as near to final grade as possible, leaving only the workroom necessary for construction of the caps.

- 5. Exploration Test Borings:** As soon as possible, the Contractor shall take soil samples or rock cores, where shown on the plans or as directed by the Engineer, in order to determine the character of the material directly below the completed shaft excavation. The soil samples shall be extracted with a split spoon sampler or undisturbed sample tube. The rock cores shall be cut with an approved triple tube core barrel to a minimum of 10 ft (3 m) below the bottom of the drilled shaft excavation before the excavation is made. The Engineer may require the depth of coring be extended up to a total depth of 20 ft (6 m). Rock core and standard penetration test samples shall be measured, visually identified and described in the Contractor's log. The samples shall be placed in suitable containers, identified by shaft location, elevation, and Project number and shall be delivered with the Contractor's field log to the Engineer within twenty-four (24) hours after each boring exploration is completed. The Engineer will inspect the samples and log in order to determine the final depth of required excavation based on evaluation of the material's suitability. The Contractor shall not start shaft drilling or construction of the shafts until the Engineer has determined the final depth of required excavation. Two (2) copies of the Contractor's final typed log shall be furnished to the Engineer within seven (7) calendar days after completion of the borings. The logs shall contain specific information about the drilling equipment and tools used and the rate of hole advancement, as well as descriptions of soil, rock, obstructions, and water encountered. The Contractor shall supply a suitable, secure location on the Site for storage of all soil and rock samples. At no time shall the soil or rock core samples be taken off the Site without the Engineer's permission to do so.

- 6. General Methods and Equipment:** The Contractor shall perform the excavations required for shafts through whatever materials are encountered, to the dimensions and elevations shown in the plans or otherwise required by the Contract. The Contractor's methods and equipment shall be suitable for the intended purpose and materials encountered. The

permanent casing method shall be used only at locations shown on the plans or authorized by the Engineer in writing. Blasting shall be permitted only if specifically authorized on the plans or in writing by the Engineer.

- 7. Uncased Construction Method:** This method consists of using water or slurry (mineral or polymer) to maintain stability of the borehole perimeter while advancing the excavation to final depth, placing the reinforcing cage, and concreting the shaft. Where drilled shafts are located in open water areas, exterior casings shall be extended from above the anticipated high water elevation into the ground in order to protect the shaft concrete from water action during placement and curing of the concrete. The exterior casing shall be installed in a manner that will produce a positive seal at the bottom of the casing, so that no piping of water or other materials occurs into or from the shaft excavation.
- 8. Casing Construction Method:** The casing method may be used either where shown on the plans or at sites where uncased construction methods are inadequate to prevent hole caving or excessive deformation of the hole. In using this method, the casing may either be placed in a predrilled hole or advanced through the ground by twisting, driving or vibration before being cleaned out.
- 9. Excavation and Drilling Equipment:** The Contractor's excavation and drilling equipment shall have adequate capacity, including power, torque and down-thrust to make it possible to excavate a hole of the maximum diameter and to a depth of twenty percent (20%) beyond the depths shown on the plans.

The excavation and overreaming tools shall be of adequate design, size and strength to perform the work shown in the plans or described herein. When the material encountered cannot be drilled using conventional earth augers with soil or rock teeth, drill buckets, grooving tools, or underreaming tools, the Contractor shall provide special drilling equipment, including but not limited to: rock core barrels, rock tools, air tools, blasting materials, or other equipment as necessary to enable construction of the shaft excavation to the size and depth required. Excavation by blasting may not be performed without the prior written approval of same by the Engineer.

- 10. Excavation:** Shaft excavations shall be made at locations and to the top of shaft elevations, estimated bottom of shaft elevations, shaft geometry and dimensions shown in the Contract. If material encountered during excavation is unsuitable for these purposes or differs from that anticipated in the design of the drilled shaft, the Contractor shall extend drilled shaft tip (base) elevations as and when the Engineer directs it to do so.

The Contractor shall maintain a construction method log during shaft excavation. The log shall contain information such as the description and approximate top and bottom elevation of each soil or rock material encountered, of seepage or ground water, and any other relevant information or observations, including a description of the tools and drill rigs used and any changes necessitated by changing ground conditions.

The Contractor shall dispose of any excavated materials removed from shaft excavations in accordance with the applicable Contract requirements for disposal of excavated materials, including those in Section 1.10.

The Contractor shall not permit workers to enter the shaft excavation for any reason unless (1) a suitable casing has been installed and the water level has been lowered and stabilized below the level to be occupied, and (2) adequate safety equipment and procedures have been provided to workers entering the excavation. Any placement of workers within the shaft excavation shall be in conformance with OSHA regulations and industry standards.

- 11. Drilled Shaft Earth Excavation:** Drilled shaft earth excavation is (1) excavation accomplished with conventional tools such as augers and drilling buckets attached to drilling equipment of the size, power, torque, and down-thrust (crowd) proposed by the Contractor in a construction procedure approved by the Engineer, or (2) successful construction of a trial drilled shaft. Earth excavation may include, but will not necessarily be limited to, excavation of clay, silt, sand, gravel, cobbles, boulders, weathered rock, and miscellaneous fill.
- 12. Drilled Shaft Rock Excavation:** Drilled shaft rock excavation is (1) excavation of competent rock, accomplished with conventional rock drilling tools, such as core barrels attached to drilling equipment of the size, power, torque, and down-thrust (crowd) as proposed by the Contractor in a construction procedure approved by the Engineer or (2) successful construction of a trial drilled shaft. Top of competent rock is as shown on the Contract drawings.
- 13. Obstructions:** When obstructions are encountered, the Contractor shall notify the Engineer of them immediately. Obstructions are defined as impenetrable objects that
- (a) cannot be removed or excavated using conventional augers fitted with soil or rock teeth, underreaming tools, or drilling buckets; or
 - (b) cause a significant decrease in the rate of excavation advancement, relative to the rate of advancement for the rest of the shaft excavation within the particular strata where the obstruction is located that had been achieved using the techniques and equipment that had previously been used successfully to excavate the shaft.

The Engineer will be the sole judge of the significance of any reduced rate of shaft advancement and of the classification of obstruction excavation. The Engineer will be present at the site of the obstruction in order to evaluate obstructions, to authorize measures for dealing with them, and to approve the designation each obstruction. Sloping bedrock or bedrock that is higher than anticipated by the plans shall not be considered as requiring obstruction excavation. Shallow obstructions are obstructions located within 5 ft (1.5 m) of the top level of the shaft. Shallow obstructions at shaft locations shall be removed at the Contractor's expense.

The Contractor shall remove all subsurface obstructions at drilled shaft locations. Such obstructions may include man-made materials, such as concrete foundations, and natural materials, such as boulders. Subsurface obstruction removal special procedures/tools may include, but are not limited to, chisels, boulder breakers, core barrels, down-the-hole hammers, air tools, hand excavation, temporary casing, and increases of the hole diameter. Blasting shall not be permitted unless specifically approved in advance in writing by the Engineer.

- 14. Lost Tools:** Drilling tools lost in the excavation shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. All costs due to lost tool removal shall be borne by the Contractor including, but not limited to, costs associated with the repair of hole degradation due to removal operations or due to the hole's remaining open for an excessively long time.
- 15. Casing:** Casings shall be steel, smooth, clean, watertight, and of ample strength to withstand both handling and installation and the pressure of both concrete and the surrounding earth materials. The outside diameter of casings shall not be less than the specified diameter of the shaft, and the outside diameter of any excavation made below the casing shall not be less than the specified diameter of the shaft. No extra compensation will be paid for concrete required to fill an oversized casing or oversized excavation. All casings, except permanent casings, shall be removed from shaft excavations. Any length of permanent casing installed below the shaft cutoff elevation shall remain in place.

When the shaft extends above ground or through a body of water, the portion exposed above ground or through the water may be formed with removable casing, except when permanent casing is specified. Removable casing shall be stripped from the shaft in a manner that will not damage the concrete. Casings may be removed when the concrete has attained sufficient strength, provided: curing of the concrete is continued for a seventy-two (72) hour period; the shaft concrete is not exposed to salt water or moving water for seven (7) days; and the concrete reaches a compressive strength of at least 2500 psi (17,235 kPa) as determined from concrete cylinder breaks.

- 16. Temporary Casing:** All subsurface casing shall be considered temporary unless specifically shown as permanent casing in the Contract. The Contractor shall be required to remove temporary casing before or immediately after completion of concreting the drilled shaft. Casing shall never be pulled after the concrete begins to set, due to probable entrapment of drilling fluid in the shaft concrete and probable separation of the concrete within the shaft.

If the Contractor elects to remove a casing and substitute a longer or larger-diameter casing through caving soils, the excavation shall either be stabilized with slurry or backfilled before the new casing is installed. Other methods approved by the Engineer may be used to control the stability of the excavation and protect the integrity of foundation materials.

Before the casing is withdrawn, the level of fresh concrete in the casing shall be a minimum of 5 ft (1.5 m) above either the hydrostatic water level in the formation or the level of drilling fluid in the annular space behind the casing, whichever is higher. As the casing is withdrawn, care shall be exercised to maintain an adequate level of concrete within the casing, so that fluid trapped behind the casing is displaced upward and discharged at the ground surface without contaminating or displacing the shaft concrete.

Temporary casings that become bound or fouled during shaft construction and cannot practicably be removed shall constitute a defect in the drilled shaft. The Contractor shall be responsible to improve such defective shafts to the satisfaction of the Engineer. Improvement may consist of, but not be limited to, removing the shaft concrete and extending the shaft deeper, in order to compensate for loss of frictional capacity in the cased zone; providing straddle shafts to compensate for capacity loss; grouting around the

exterior of the shaft; or providing a replacement shaft. All corrective measures, including redesign of footings caused by defective shafts, shall be done to the satisfaction of the Engineer by the Contractor without either compensation or an extension of Contract time of the Project. In addition, no compensation will be paid for casing remaining in place.

- 17. Permanent Casing:** Permanent casing shall be used where specified by the Contract. The casing shall be continuous between top and bottom elevations as shown in the plans. After installation is complete, the permanent casing shall be cut off at the prescribed elevation.

In cases in which special temporary casings are shown on the plans or authorized in writing by the Engineer to be used in conjunction with permanent casing, the Contractor shall maintain both alignment of the temporary casing with the permanent casing and a positive, watertight seal between the two casings during excavation and concreting operations.

Permanent casing shall maintain close contact with the surrounding earth after installation. Use of an oversized hole or temporary casing outside the permanent casing beneath the ground surface will not be allowed without the advance written permission of the Engineer to do so. Should an oversized hole or temporary casing outside the permanent casing beneath the ground surface be allowed by the Engineer, grouting of the exterior annular space shall be provided by the Contractor in order to create close contact between the casing and the surrounding ground. The grouting shall extend from the bottom of the annular space to an elevation determined by the Engineer. No compensation will be paid to the Contractor for grouting of the exterior annular space.

- 18. Slurry:** Mineral or polymer slurries shall be employed when slurry is used in the drilling process, unless other drilling fluids are approved in writing by the Engineer. Mineral slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to allow it to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the mineral suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. The slurry head shall remain above the piezometric head of the groundwater. This includes initial drilling of the borehole down to the piezometric level. Slurry shall be introduced when the depth of the borehole is still above the piezometric level, not after the inflow of water can be detected and sloughing has begun. In the event of a sudden significant loss of slurry to the hole, the construction of that foundation shall be stopped until either a method to stop slurry loss or an alternate construction procedure has been approved by the Engineer.

Mineral slurry shall be premixed thoroughly with clean fresh water and adequate time (as prescribed by the mineral manufacturer) shall be allotted for hydration prior to introduction into the shaft excavation. Slurry tanks of adequate capacity shall be required for slurry circulation, storage, and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without the written consent of the Engineer to the substitution. Desanding equipment shall be provided by the Contractor as necessary to keep slurry sand content at less than

four percent (4%) by volume at any point in the borehole at the time the slurry is introduced, including situations in which temporary casing will be used. The Contractor shall take all steps necessary to prevent the slurry from "setting up" in the shaft. Such methods may include, but are not limited to: agitation, circulation and adjusting the properties of the slurry. The Contractor shall dispose of all slurry in suitable off-Site areas. Disposal of the slurry shall also comply with Section 1.10.

Control tests using suitable apparatus shall be carried out on the mineral slurry by the Contractor in order to determine density, viscosity and pH. An acceptable range of values for mineral slurry physical properties is shown in Table 7.01-1:

TABLE 7.01-1, MINERAL SLURRY PROPERTIES
(Sodium Bentonite or Attapulgite in Fresh Water)

Property	Acceptable Range of Values		
	At Time of Slurry Introduction	In Hole at Time of Concreting	Test Method
Density - pcf (kN/m ²)	64.3* - 69.1* (10.1* - 10.8*)	64.3* - 75.0* (10.1* - 11.8*)	Density Balance
Viscosity - sec./quart (sec./liter)	28 - 45 (26 - 43)	28 - 45 (26 - 43)	Marsh Funnel
pH	8 - 11	8 - 11	pH paper, pH meter
<p>* Increase by 2 pcf (0.3 kN/m²) in salt water</p> <p>Notes:</p> <p>(a) Tests shall be performed when the slurry temperature is above 40° F (4.5° C).</p> <p>(b) If desanding is required, sand content shall not exceed 4% (by volume) at any point in the borehole, as determined by the American Petroleum Institute sand content test when the slurry is introduced.</p>			

Tests to determine density, viscosity and pH value shall be performed during the shaft excavation to establish a consistent working pattern. A minimum of four (4) sets of tests shall be made during the first eight (8) hours of slurry use. When the tests show consistent results, the testing frequency may be decreased to one (1) set every four (4) hours of slurry use.

If the Contractor proposes to use polymer slurry, either natural or synthetic, use of the product must be approved in advance by the Engineer. Slurry properties at the time of mixing and at the time of concreting must comply with the manufacturer's written recommendations. Whatever product is used, the sand content at the base of the drilled shaft excavation shall not exceed one percent (1%) when measured by Method API 13B-1, Section 5, immediately prior to concreting.

If the Contractor proposes to use blended mineral-polymer slurry, the Contractor shall submit to the Engineer a detailed report specific to the Project, prepared and signed by a qualified slurry consultant, describing the proposed slurry materials, the mix proportions, mixing methods and quality control methods.

If polymer slurry, or blended mineral-polymer slurry, is proposed, the Contractor's slurry management plan shall include detailed provisions for controlling the quality of the slurry, including tests to be performed, the frequency of those tests, the test methods, and any maximum or minimum property requirements that must be met in order to ensure that the slurry meets its intended functions in the subsurface conditions at the Project site and with the construction methods to be used. The slurry management plan shall include a set of the slurry manufacturer's written recommendations and shall include the following tests, as a minimum: Density test (API 13B-1, Section 1), viscosity test (Marsh funnel and cup, API 13B-1, Section 2.2, or approved viscometer), pH test (pH meter, pH paper), and sand content test (API sand content kit, API 13B-1, Section 5).

If such a proposal is approved by the Engineer, the Contractor may use water as a drilling fluid. In that case, all of the provisions in Table 7.01-1 for mineral slurries must be met, except that the maximum density shall not exceed 70 pcf (11 kN/m²).

The Contractor shall ensure that a heavily-contaminated slurry suspension, which could impair the free flow of concrete, has not accumulated in the bottom of the shaft. Prior to placing concrete in any shaft excavation, the Contractor shall take slurry samples using a sampling tool approved by the Engineer. Slurry samples shall be extracted from the base of the shaft and at intervals not exceeding 10 ft (3 m) up the slurry column in the shaft, until two (2) consecutive samples produce acceptable values for density, viscosity, and pH.

When any slurry samples are found to be unacceptable, the Contractor shall take whatever action is necessary to bring the slurry within specification requirements. Concrete shall not be placed until the slurry in the hole is re-sampled and test results produce acceptable values.

Reports of all tests specified above, signed by an authorized representative of the Contractor, shall be furnished to the Engineer on completion of each drilled shaft.

During construction, the level of mineral or blended mineral-polymer slurry in the shaft excavation shall be maintained at a level not less than 4 ft (1.2 m) above the highest expected piezometric pressure head along the depth of the shaft, and the level of polymer slurry shall be maintained at a level not less than 6 ft (1.8 m) above the highest expected piezometric pressure head along the shaft. If at any time, in the opinion of the Engineer, the slurry construction method fails to produce the desired final results, the Contractor shall discontinue this method and propose an alternate method for approval by the Engineer.

Drilling tools shall contain vents to stabilize hydrostatic pressure above and below the tool during insertion and extraction. The rate of tool extraction shall not cause any noticeable turbulence in the slurry column in the borehole.

The Contractor shall arrange for the slurry manufacturer's technical representative to be present at the Site during Project startup, or throughout the entire Project if continual difficulty is expected, in order to ensure that the slurry is mixed and managed properly.

- 19. Excavation Inspection:** The Contractor shall check the dimensions and alignment of each shaft excavation. Final shaft depths shall be measured with a suitable weighted tape or other approved method after final cleaning. The Contractor shall provide equipment and

access to the Engineer for confirming dimension, alignment, and bottom cleanliness. Acceptable shaft cleanliness will be determined by the Engineer.

20. Construction Tolerances: The following construction tolerances apply to drilled shafts, unless otherwise stated in the Contract:

- (a) The center of the drilled shaft shall be within 3 in (76 mm) of plan position in the horizontal plane at the plan elevation for the top of the shaft.
- (b) The vertical alignment of a vertical shaft excavation shall not vary from the plan alignment by more than 1/4 in/ft (21 mm/m) of depth.
- (c) After the concrete is placed, the top of the reinforcing steel cage shall be no more than 6 in (150 mm) above and no more than 3 in (76 mm) below plan position.
- (d) All casing diameters shown on the plans refer to outside diameter ("OD") dimensions. The dimensions of casings are subject to American Petroleum Institute tolerances applicable to regular steel pipe. The Contractor may elect to provide a casing larger in diameter than shown in the plans, if the Engineer approves its doing so.
- (e) The top elevation of the shaft shall have a tolerance of plus 1 in (25 mm) or minus 3 in (76 mm) from the plan top-of-shaft elevation.
- (f) Excavation equipment and methods shall be designed so that the completed shaft excavation will have a planar bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of +/- 3/8 in/ft (+/- 3 mm/m) of diameter.

Drilled shaft excavations and completed shafts not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable shaft excavations and completed shafts to the satisfaction of the Engineer. Materials and work necessary, including engineering analysis and redesign, in order to complete corrections for out-of-tolerance drilled shaft excavations, shall be furnished without cost to the State or extension of Contract time.

21. Reinforcing Steel Cage Construction and Placement: The reinforcing steel cage, consisting of longitudinal bars, ties, cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted, and prior to concrete placement. Internal stiffeners shall be removed as the cage is placed in the borehole, so as not to interfere with the placement of concrete.

The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals near the bottom and at intervals not exceeding 10 ft (3 m) up the shaft, in order to ensure concentric spacing for the entire cage length. Spacers shall be constructed of approved material, equal in quality and durability to the concrete specified for the shaft. The spacers shall be of adequate dimension to ensure

a minimum 3 in (76 mm) annular space between the outside of the reinforcing cage and the side of the excavated hole. Approved cylindrical concrete feet (bottom supports) shall be provided to ensure that the bottom of the cage is maintained the proper distance above the base.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the upward displacement of the rebar cage exceeds 2 in (51 mm) or if the downward displacement exceeds 6 in per 20 ft (152 mm per 6 m) of shaft length, the drilled shaft will be considered defective. In such a case, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional shafts shall be constructed until the Contractor has modified the rebar cage support in a manner satisfactory to the Engineer.

22. Concrete Placement: Concrete placement shall be performed in accordance with the applicable portions of Section 6.01 and with the requirements herein dealing with concrete materials.

Concrete shall be placed as soon as possible after reinforcing steel placement and after the Engineer has accepted the cleanliness of the shaft. The Engineer may re-inspect the shaft for cleanliness should there be any delays between initial acceptance of shaft cleanliness and commencement of the concrete placement. If during such a delay the Engineer has determined that shaft cleanliness has deteriorated, the Engineer may require the Contractor to re-clean the shaft. The Contractor may be required to remove the rebar cage should it be necessary in order to achieve the required shaft cleanliness. The Contractor will not be compensated for any cost or loss of time due to the need to re-clean the shaft.

Concrete placement shall be continuous from the bottom to the top elevation of the shaft. Concrete placement shall continue after the shaft excavation is filled and good quality concrete is evident at the top of shaft. Concrete shall be placed by free fall, or through a tremie or concrete pump. Free fall placement will be permitted only in dry holes. Concrete placed by free fall shall fall directly to the base without contacting the rebar cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

The Contractor shall maintain Concreting Logs during all concrete placement. The log shall include, but not be limited to, concreting curves plotting Depth-to-Top of Concrete vs. Volume of Concrete Placed (for both theoretical and actual volumes of concrete placed). The Contractor shall provide a copy of each log to the Engineer upon completion of each drilled shaft concrete placement. A sample of the proposed log to be used by the Contractor shall be submitted as part of the Installation Plan working drawing submittal.

23. Tremies: Tremies may be used for concrete placement in either wet or dry holes. Tremies used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the shaft base elevation. The tremie shall not contain aluminum parts that may come in contact with the concrete. The tremie's inside diameter shall be at least six (6) times the maximum size of aggregate used in the concrete mix, but shall not be less than 10 in (254 mm). The inside and outside surfaces of the tremie shall be clean and

smooth in order to permit flow of concrete and unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends, which would restrict concrete placement.

The tremie used for wet excavation concrete placement shall be watertight. Underwater or under-slurry placement shall not begin until the tremie is placed to the shaft base elevation, and the concrete shall be kept completely separated from the water or slurry prior to the time that it is discharged. Valves, bottom plates or plugs may be used for this purpose only if concrete discharge can begin within 1 tremie diameter of the base of the drilled shaft. Plugs shall either be removed from the excavation or be of a material approved by the Engineer that will not cause a defect in the shaft if not removed. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall be immersed at least 5 ft (1.5 m) in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The level of the concrete in the tremie shall be maintained above the level of slurry or water in the borehole at all times, in order to prevent water or slurry intrusion into the shaft concrete.

If at any time during the concrete placement, the tremie line orifice is removed from the fluid concrete column and it discharges concrete above the rising concrete level, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor.

- 24. Pumped Concrete:** Concrete pumps and lines may be used for concrete placement in either wet or dry excavations. All pump lines shall have a minimum 4 in (102 mm) diameter and be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the shaft base elevation.

For wet excavations, a plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or be of a material approved by the Engineer that will not cause a defect in the shaft if not removed.

The discharge orifice shall remain at least 5 ft (1.5 m) below the surface of the fluid concrete. When lifting the pump line during concreting, the Contractor shall temporarily reduce the line pressure until the orifice has been repositioned at a higher level in the excavation.

If at any time during the concrete placement the pump line orifice is removed from the fluid concrete column and it discharges concrete above the rising concrete level, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor.

- 25. Drop Chutes:** Drop chutes may be used to direct placement of free-fall concrete in excavations where the maximum depth of water does not exceed 3 in (76 mm). Free fall placement is not permitted in wet excavations. Drop chutes shall consist of a smooth tube of either one-piece construction or sections that can be added and removed. A drop chute can also be a hopper with a short tube to direct the flow of concrete. Concrete may be placed through either the hopper at the top of the tube or side openings as the drop chute

is retrieved during concrete placement. If concrete placement causes the shaft excavation to cave or slough, or if the concrete strikes the rebar cage or sidewall, the Contractor shall reduce the height of free fall or reduce the rate of concrete flow into the excavation, or both. If caving or sloughing of the borehole walls occurs during free-fall placement of concrete, the shaft will be considered defective. All costs of repair or replacement of defective shafts shall be the responsibility of the Contractor. If concrete placement cannot be satisfactorily accomplished by free fall, in the opinion of the Engineer, the Contractor shall use either tremie or pumping techniques to accomplish the concrete placement.

- 26. Access Tubes for Crosshole Acoustic Logging:** Access tubes for crosshole acoustic logging shall be placed on each reinforcing cage designated in the Contract in the position and at the frequency shown on the plans. Access tubes must be firmly secured to the cage. Normally, the tubes shall extend from 6 in (150 mm) above the bottom of the shaft to at least 3 ft (0.9 m) above the top of the shaft, or 2 ft (0.6 m) above the ground surface if the shaft is cut off below the ground surface. If cross-hole acoustic tests are to be performed, the access tubes shall be filled with clean water no later than four (4) hours after placement of the concrete and the tubes capped during concrete placement to keep out concrete and debris. In all cases, the access tubes shall be as nearly parallel as possible and be placed as far from the longitudinal steel bars as possible.

Prior to the beginning of downhole logging, the Contractor shall assure that the Cross-Hole Acoustic Logging test probes can pass through every tube to the bottom. If a tube is obstructed, the entire length of the obstructed access tube will not be measured for payment. The Engineer may also require the Contractor to core a hole within the drilled shaft near and to the full depth of the obstructed tube. The cored hole shall be large enough to accommodate the test probe for the full length of the hole. The coring equipment, coring procedure and location of the core hole shall be approved by the Engineer before the coring process may begin. The coring method shall provide for complete core recovery and shall minimize abrasion and erosion of the core. The core hole shall be placed at a position in the shaft that will not produce damage to the reinforcing steel in the shaft. The core hole shall be logged, voids or defects indicated on the log, and the log submitted to the Engineer. Cores shall be preserved and made available for inspection by the Engineer. The core hole will be treated as an access tube for downhole testing. Core holes that are drilled to substitute for a blocked access tube shall be measured and paid for at the Contract unit price for Access Tubes.

Upon completion of all tests involving access tubes and after acceptance of the drilled shaft, the access tubes and core holes shall be filled with grout.

- 27. Evaluation and Acceptance or Rejection of Drilled Shafts:** Upon completion and integrity testing (if called for) of a drilled shaft, the Engineer will review all available drilling logs, drilled shaft construction logs, concreting logs, inspection reports, load test results, and integrity test results in order to determine the acceptability of the drilled shaft. If the Engineer determines that available data is inconclusive, the Engineer may call for additional integrity testing, coring, or other appropriate actions necessary for evaluating the drilled shaft. Should the additional integrity testing or coring confirm the presence of anomalies, the Contractor will not be compensated for the cost of the additional integrity testing or coring (even if the anomalies are determined to be non-critical and the shaft is found to be acceptable). Should additional integrity testing or coring demonstrate that anomalies are

not present (prior to any remedial work), the additional integrity testing or coring will be paid for by the Department. The Contractor may continue to construct drilled shafts before receipt of notice of acceptance of the tested shaft or shafts by the Engineer. If the Engineer finds previously-constructed shaft(s) to be unacceptable, the Contractor shall be required to repair, at its expense, the unacceptable shaft(s) to the satisfaction of the Engineer. The Contractor shall prove to the satisfaction of the Engineer, at no expense to the State, the acceptability of all shafts constructed since the time that the unacceptable shaft was constructed and to prove the acceptability of the procedure to be used in constructing future shafts. If the Engineer deems the construction procedure to be unacceptable, the Contractor shall cease all drilled shaft construction until submittal of a new construction procedure to the Engineer and the Engineer has accepted it.

The Contractor shall submit repair procedures to the Engineer for review and approval. If these plans involve change of or impact on the structural design of the shafts or shaft caps, or the geometry of the shafts, any proposed redesign of the Contractor's plan shall be performed at the Contractor's expense by a qualified Professional Engineer registered in the State of Connecticut.

The Engineer may require that additional shafts be tested. If the testing of the additional shaft(s) indicates the presence of a defect in any additional shaft, the testing cost for that shaft shall be borne by the Contractor, and the Contractor shall repair the shaft at its own expense, as above. Any additional testing required by the Engineer on repaired drilled shafts shall be considered part of the Contractor's remediation plan, to be paid for by the Contractor.

7.01.04 - Method of Measurement:

- 1. Furnishing Drilled Shaft Drilling Equipment:** There will be no measurement of the work performed under this Lump Sum item.
- 2. Drilled Shaft** will be measured for payment by the length in linear feet (meters) of the completed and accepted concrete drilled shaft, of the diameter and containing the reinforcement shown on the plans. The length will be determined as the difference between the plan top-of-shaft elevation and the final bottom-of-shaft elevation.
- 3. Drilled Shaft Earth Excavation** will be measured for payment by the length in linear feet (meters) of completed earth excavation of the diameter shown on the plans (measured along the centerline of the shaft), either from the top of existing grade elevation prior to drilling or from the bottom of the drilled shaft cap elevation (whichever is lower), to either the top of competent rock elevation (if the drilled shaft extends onto or into competent rock) or to the bottom of the shaft elevation (if the shaft does not extend onto or into competent rock).
- 4. Drilled Shaft Rock Excavation** will be measured for payment by the length in linear feet (meters) of completed rock excavation of the diameter shown on the plans, measured along the centerline of the shaft from the top-of-competent-rock elevation to the bottom-of-the-shaft elevation
- 5. Obstructions** will be measured for payment, after designation as an obstruction by the

Engineer, by the number of hours of work, or fraction thereof per obstruction, required to remove the obstruction.

6. **Trial Drilled Shaft** will be measured for payment by the authorized linear feet (meters) of trial shaft holes drilled to the diameter shown on the plans, completed (including backfill and restoration of area, when required) and accepted. The length of trial shaft holes will be determined as the difference between the existing ground surface elevation at the center of the trial shaft hole prior to drilling and the authorized bottom elevation of the hole.
7. **Exploration Test Borings** will be measured for payment by the length in linear feet (meters), measured from the existing grade elevation to the bottom elevation of the exploration hole, for each authorized exploration boring drilled.
8. **Permanent Casing** will be measured for payment by the length in linear feet (meters) of each diameter casing installed and accepted. The length to be paid will be measured along the casing from the top-of-the-shaft elevation or the top of the casing, whichever is lower, to the bottom of the casing at each shaft location where permanent casing is used.
9. **Access Tubes** will be measured for payment by the length in linear feet (meters) of unobstructed access tube, installed and accepted in the drilled shafts, to the depths shown on the plans

7.01.05 - Basis of Payment:

1. **Furnishing Drilled Shaft Drilling Equipment:** Payment for this item will be at the Contract lump sum price for "Furnishing Drilled Shaft Drilling Equipment" which will be considered full and complete payment for furnishing and moving the drilling equipment to the Site, setting up the equipment at the required locations, and removing the equipment from the Site.

Payment of sixty percent (60%) of the lump sum amount bid for this item will be made when all drilling equipment is on the Site, assembled and ready to drill foundation shafts. Payment of the remaining forty percent (40%) of the lump sum amount will be made when all shafts have been drilled, all shaft concrete has been placed to the top of the shaft, all defects are repaired, and all drilled shafts have been accepted by the State.

2. **Drilled Shaft:** Drilled shafts will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft (Diameter)" complete and accepted in place, including submittals, concrete and reinforcing steel, all labor, equipment, materials, temporary casings, slurry, slurry technical representative, blasting (if allowed), protection of existing facilities or utilities, vibration monitoring and incidentals necessary to complete the drilled shaft.
3. **Drilled Shaft Earth Excavation:** This work will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft Earth Excavation (Diameter)" complete, including all labor, equipment, materials, water control, and disposal of excavated material necessary.
4. **Drilled Shaft Rock Excavation:** Drilled shaft rock excavation will be paid for at the Contract unit price per linear foot (meter) for "Drilled Shaft Rock Excavation (Diameter)" complete, including all labor, equipment, materials, water control, and disposal of excavated

material necessary. No payment will be made for additional rock excavation or placement of additional shaft concrete resulting from blasting overbreak (if blasting is allowed).

- 5. Obstructions:** Removal of obstructions will be paid for at the Contract unit price per hour for “Obstructions” complete, including all labor, equipment, materials, excavation of obstructions, water control, disposal of excavated material necessary. If the Contractor chooses to use a larger shaft diameter for obstruction excavation, no additional compensation will be paid for performing such oversized obstruction excavation.
- 6. Trial Drilled Shaft:** Trial drilled shafts will be paid for at the Contract unit price per linear foot (meter) for “Trial Drilled Shaft (Diameter)” complete and accepted, including all labor, equipment, materials, excavation of the trial drilled shaft through whatever materials are encountered, to the bottom of shaft elevation shown on the plans or as authorized by the Engineer (using slurry approved by the Engineer as necessary), providing inspection facilities, backfilling the hole, restoring the Site as required, and all other expenses to complete the trial shaft.
- 7. Exploration Test Borings:** Soil samples, rock cores or both, of the diameter and length required and authorized by the Engineer will be paid for at the Contract unit price per linear foot (meter) for “Exploration Test Boring” complete, including drilling, extracting, packaging and classifying samples or cores, delivery of same to the Engineer, furnishing concrete or grout to fill the core hole, providing a written log of the hole, and all other expenses necessary.
- 8. Permanent Casing:** Permanent casings will be paid for at the Contract price per linear foot (meter) for “Permanent Casing (Diameter)” complete, including furnishing and placing the permanent casing in the shaft excavation.
- 9. Access Tubes:** Access tubes will be paid for at the Contract unit price per linear foot (meter) of unobstructed “Access Tubes” complete and accepted, installed in the drilled shafts to the depths shown on the plans, including the post-test grouting of the access tubes.

Pay Item	Pay Unit
Furnishing Drilled Shaft Drilling Equipment	l.s. (l.s.)
Drilled Shaft (Diameter)	l.f. (m)
Drilled Shaft Earth Excavation (Diameter)	l.f. (m)
Drilled Shaft Rock Excavation (Diameter)	l.f. (m)
Obstructions	hr. (hr.)
Trial Drilled Shaft (Diameter)	l.f. (m)
Exploration Test Boring	l.f. (m)
Permanent Casing (Diameter)	l.f. (m)
Access Tubes	l.f. (m)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 7.02
PILES**

Delete the entire section and replace it with the following:

**SECTION 7.02
PILES**

7.02.01—Description

7.02.02—Materials

7.02.03—Construction Methods

7.02.04—Method of Measurement

7.02.05—Basis of Payment

7.02.01—Description: This item shall consist of furnishing and driving foundation piles of the type and dimensions designated. Piles shall conform to and be installed in accordance with these specifications, and at the location, and to the elevation, penetration and/or capacity shown on the plans, or as directed by the Engineer. If specified in the plans or directed by the Engineer, piles shall be tipped, shaped, reinforced or otherwise pointed and strengthened

Test piles shall be piles of the type specified, driven in advance of placing orders for the piles, for the purpose of determining length or bearing capacity of piles. The Contractor shall furnish the piles in accordance with an itemized order list which will be furnished by the Engineer, showing the number and length of all piles. When test piles are specified, the pile lengths shown on the plans are for estimating purposes only. The actual lengths to be furnished for production piles will be determined by the Engineer after the test piles have been driven.

7.02.02—Materials: Piles of the type indicated on the plans shall conform to the requirements of Articles M.09.02 and M.14.01.

7.02.03—Construction Methods

1. Pile Types:

(a) Timber Piles: The method of storing and handling timber piles shall be such as to avoid damage to the piles. Special care shall be taken to avoid breaking the surface of treated piles. Cant dogs, hooks, or pike-poles shall not be used. Cuts or breaks in the surface of treated piling shall be given three brush coats of hot creosote oil of approved quality, and hot creosote oil shall be poured into all bolt holes.

(b) Steel Piles: The methods of storing and handling steel piles shall be such as to prevent damage to the piles and to protect them from corrosion.

(c) Cast-In-Place Concrete Piles: Cast-in-place concrete piles shall be constructed by driving steel shells and filling them with concrete. Shells shall be continuously or incrementally tapered, or cylindrical, or a combination of continuously or incrementally

tapered lower sections, which are extended with cylindrical upper sections, unless otherwise provided in the plans or special provisions. The tapered portion of piles shall have a minimum tip diameter of 8 inches (200 millimeters) and shall change in diameter not less than 1 inch in every 12 feet (7 millimeters/meter). Cylindrical piles and the cylindrical extension portions of tapered piles shall have a minimum diameter of 12 inches (300 millimeters). Shells for cast-in-place concrete piles shall be formed by joining sections of the same manufacture, unless otherwise permitted by the Engineer. Composite shell piles, which are piles composed of different thicknesses or of different manufacture, shall not be used unless shown on the plans or approved by the Engineer. Prefabricated driving points or other type tip enclosures shall be subject to the approval of the Engineer.

The Contractor shall furnish shells of a type and gage which can be driven without distortion. Shells which fail, fracture or otherwise distort during driving or after driving shall be withdrawn or replaced at the Contractor's expense. The metal of shells which are to be driven without a mandrel shall be of sufficient thickness to withstand the driving without failure, fracture or distortion, but in no case shall the thickness be less than No. 7 gage. Shells driven with a mandrel shall have a thickness not less than No. 18 gage. Piles having a shell thickness less than No. 9 gage shall be reinforced as shown on the plans.

Composite shell piles formed by extending lower sections of No. 7 or heavier gage, with upper sections of lighter than No. 7 gage, shall be driven with an internal mandrel in such a manner so as to insure shell alignment and maximum hammer energy transmission throughout the pile shell length. All details concerning compatibility of shell and mandrel construction shall be subject to the approval of the Engineer.

After driving has been completed, the shell shall be inspected and approved before any concrete is placed. The Contractor shall provide suitable lights and other equipment necessary to inspect each shell throughout its length.

All seams, joints and splices in shells shall develop the full strength of the shell and shall be watertight. Damaged shells that are unacceptable to the Engineer shall be filled with sand and a replacement shell or shells shall be driven adjacent thereto.

Reinforcement shall be placed in accordance with the requirements of the plans or special provisions.

No concrete shall be placed in a pile until all driving within a radius of 15 feet (4.5 meters) from the pile has been completed, or until all the shells for any one bent have been completely driven. If this is not practical, all driving within the above limits shall be discontinued until the concrete in the last pile cast has set at least 7 days.

Concrete shall be placed continuously in each pile, care being used to fill every part of the shell, and to work concrete around the reinforcement without displacing it. No concrete shall be placed in shells containing an accumulation of water or any foreign material.

Extensions, or "build-ups" on concrete piles, shall be avoided; but when necessary, they shall be made as specified in Subarticle 7.02.03-7.

(d) Prestressed Concrete Piles (Pretensioned): The piles shall be manufactured in accordance with the provision of Article 5.14.03, except as follows:

(1) Forms: The forms for the piles shall be of substantial construction and shall produce a uniformly smooth surface on all formed sides. A minimum concrete cover of 2 inches (50 millimeters) shall be maintained for prestressing elements by the use of spreaders or by bundling in areas adjacent to openings or inserts. Ties shall also have a minimum cover of 2 inches (50 millimeters) at these locations. Side forms carrying no load may be removed after 24 hours with the permission of the Engineer or after the concrete has reached the minimum transfer strength as required by Subarticle M.09.02-6.

(2) Finishing: The topside surface of the piles shall be given a uniformly smooth steel trowel finish to match the surface of the formed sides. The prestressing elements shall be cut flush or recessed 1/8 inch (3 millimeters) to the top of the pile. Projecting fins and surface imperfections shall be removed in a workmanlike manner. Exposed jet pipe connections, inserts or other devices shall be removed or recessed to a depth as directed, and the hole or opening patched with non-shrink grout in a workmanlike manner. The patching material shall have a degree of finish comparable to the adjacent surfaces. Additional finishing of piles, if required, shall be as shown on the plans or as otherwise directed.

(3) Handling and Storage: Care shall be taken during storage, transporting, hoisting and handling of the prestressed piles to prevent cracking or damage. Damaged piles shall be replaced by the Contractor at his expense. Lifting and support points shall be marked on the piles as required.

(4) Pile Extensions: Pile extensions shall normally be fabricated for this purpose in accordance with the specifications. However, sound sections of pile cutoffs or sound portions of rejected piles may be used, subject to the approval of the Engineer. Short pile extensions may, with the permission of the Engineer, be cast-in-place monolithically with the footing or cap.

2. Pile Driving Equipment:

(a) Hammers: Piles shall be driven with approved air, steam, diesel, or hydraulic hammers or a combination of acceptable hammer and water jet. The plant and equipment furnished for air/steam hammers shall have sufficient capacity to maintain at the hammer, under working conditions, the volume and pressure specified by the manufacturer. The plant and equipment shall be equipped with accurate pressure gauges which are easily accessible to the Engineer. The valve mechanism and other parts of the hammer shall be properly maintained so that the length of stroke for a single-acting hammer and the number of blows per minute for a double-acting hammer will be obtained. The power plant for hydraulic hammers shall have sufficient capacity to maintain at the hammer, under working conditions, the volume and pressure specified by the manufacturer. The power plant and equipment shall be equipped with accurate pressure gauges which are easily accessible to the Engineer.

The size of hammer shall be adapted to the type and size of piles and the driving conditions. Unless otherwise specified, the minimum rated striking energy per blow for

hammers used shall be 7,000-foot pounds (9,500 joules) for driving timber piles; 15,000-foot pounds (20,000 joules) for driving steel piles and for driving shells for cast-in-place concrete piles; and 19,000-foot pounds (25,000 joules) for driving precast concrete piles and for driving prestressed concrete piles. The hammer model used for the driving of test piles shall be used for the driving of service or production piles, unless a change is authorized by the Engineer in writing. Hammers delivering an energy which the Engineer considers detrimental to the piles shall not be used.

Non-impact hammers, such as vibratory hammers, or driving aids such as jets, followers, pre-augered and prebored holes shall not be used unless either specifically permitted in writing by the Engineer or stated in the contract documents.

(b) Pile Hammer Approval: All pile driving equipment furnished by the Contractor shall be subject to the approval of the Engineer. All pile driving equipment shall be sized in such a way that the piles can be driven with reasonable effort to the ordered lengths without damage. Approval of pile driving equipment by the Engineer will be based on wave equation analysis and/or other judgments. In no case shall the driving equipment be used without written approval of the Engineer. Prerequisite to such approval, the Contractor shall submit to the Engineer the necessary pile driving equipment information and wave equation analysis at least 30 days prior to driving piles. The wave equation analysis shall be signed, sealed and dated by a Connecticut licensed Professional Engineer.

The criteria that the Engineer will use to evaluate the driving equipment consists of both the required number of hammer blows per foot (per 0.25 meters) as well as the pile stresses at the required ultimate pile capacity. The required number of hammer blows indicated by the wave equation at the ultimate pile capacity shall be between 36 and 180 blows per foot (29 and 147 blows per 0.25 meters) for the driving equipment to be acceptable. In addition, for the driving equipment to be acceptable the pile stresses which are indicated by the wave equation to be generated by the driving equipment shall not exceed the maximum driving stresses allowed by the governing design code stated in the contract documents.

During pile driving operations, the Contractor shall use the approved system. No variations in the driving system will be permitted without the Engineer's written approval. Any change in the driving system will only be considered after the Contractor has submitted the necessary information for a revised wave equation analysis.

If the Engineer determines the Contractor's hammer is unable to transfer sufficient energy to the pile, the hammer shall be removed from service until repaired to the satisfaction of the Engineer.

(c) Drive System Components and Accessories:

(1) Hammer Cushion: Impact pile driving equipment designed to be used with a hammer cushion shall be equipped with a suitable thickness of hammer cushion material to prevent damage to the hammer or pile and to insure uniform driving behavior. Hammer cushions shall be made of durable manufactured materials, provided in accordance with the hammer manufacturer's guidelines. Wood, wire rope, and asbestos hammer cushions are specifically disallowed and shall not be

used. A striker plate as recommended by the hammer manufacturer shall be placed on the hammer cushion to insure uniform compression of the cushion material. The hammer cushion shall be removed from the helmet and inspected prior to beginning pile driving at each structure or after each 100 hours of pile driving, whichever is less. The Contractor shall replace any hammer cushion whose thickness is less than 75% of the original thickness.

(2) Helmet: Piles driven with impact hammers require an adequate helmet or drive head to distribute the hammer blow to the pile head. The helmet shall be axially aligned with the hammer and the pile. The helmet shall be guided by the leads and not be free-swinging. The helmet shall fit around the pile head in such a manner as to prevent transfer of torsional forces during driving, while maintaining proper alignment of hammer and pile. For steel and timber piling, the pile heads shall be cut squarely and a helmet, as recommended by the hammer manufacturer, shall be provided to hold the axis of the pile in line with the axis of the hammer. For precast concrete and prestressed concrete piles, the pile head shall be plane and perpendicular to the longitudinal axis of the pile to prevent eccentric impacts from the helmet. For special types of piles, appropriate helmets, mandrels or other devices shall be provided in accordance with the manufacturer's recommendations so that the piles may be driven without damage.

(3) Pile Cushion: The heads of concrete piles shall be protected by a pile cushion. Pile cushions shall be made of plywood, hardwood, or composite plywood and hardwood materials. The minimum pile cushion thickness placed on the pile head prior to driving shall be at least 4 inches (100 millimeters). A new pile cushion shall be provided for each pile. In addition the pile cushion shall be replaced if, during the driving of any pile, the cushion is compressed more than one-half the original thickness or it begins to burn. The pile cushion dimensions shall match the cross sectional area of the pile top. The use of manufactured pile cushion materials in lieu of a wood pile cushion shall be evaluated on a case by case basis.

(4) Leads: Piles shall be supported in line and position with leads while being driven. Pile driver leads shall be constructed in a manner that affords freedom of movement of the hammer while maintaining alignment of the hammer and the pile to insure concentric impact for each blow. Leads may be either fixed or swinging type. Swinging leads, when used, shall be fitted with a pile gate at the bottom of the leads and, in the case of batter piles, a horizontal brace may be required between the crane and the leads. The pile section being driven shall not extend above the leads. The leads shall be adequately embedded in the ground or the pile constrained in a structural frame such as a template to maintain alignment. The leads shall be of sufficient length to make the use of a follower unnecessary, and shall be so designed as to permit proper alignment of batter piles.

(5) Followers: Followers shall only be used when approved in writing by the Engineer, or when specifically stated in the contract documents. In cases where a follower is permitted, the first pile in each bent and every tenth pile driven thereafter shall be driven full length without a follower, to determine that adequate pile penetration is being attained to develop the ultimate pile capacity. The follower and pile shall be held and maintained in equal and proper alignment during driving. The follower shall be of such material and dimensions to permit the piles to be driven to the penetration depth

determined necessary from the driving of the full length piles. The final position and alignment of the first two piles installed with followers in each substructure unit shall be verified to be within the required location tolerances before additional piles are installed.

(6) Jets: Jetting shall only be permitted if approved in writing by the Engineer or when specifically stated in the contract documents. When jetting is not required in the contract documents, but approved after the Contractor's request, the Contractor shall determine the number of jets and the volume and pressure of water at the jet nozzles necessary to freely erode the material adjacent to the pile without affecting the lateral stability of the in place pile. When jetting is specifically required in the contract documents, the plant shall have sufficient capacity to deliver at all times at least 100 psi (700 kilopascals) pressure at two 3/4-inch (19 millimeter) jet nozzles. In either case, unless otherwise indicated by the Engineer, jet pipes shall be removed when the pile toe is a minimum of 5 feet (1.5 meters) above prescribed toe elevation and the pile shall be driven to the required ultimate pile capacity with an impact hammer. Also, the Contractor shall control, treat if necessary, and dispose of all jet water in a manner satisfactory to the Engineer and in accordance with the provisions of Article 1.10.

(7) Pre-Augering: When stated in the contract documents, the Contractor shall pre-auger holes at pile locations to the depths shown on the plans. Pre-augered holes shall be of a size smaller than the diameter or diagonal of the pile cross section; however, large enough to allow penetration of the pile to the specified depth. If subsurface obstructions, such as boulders or rock layers, are encountered, the hole diameter may be increased to the least dimension which is adequate for pile installation. Any void space remaining around the pile after completion of driving shall be filled with sand or other approved material. The use of spuds shall not be permitted in lieu of pre-augering. Augering, wet-rotary drilling, or other methods of pre-augering shall be used only when approved by the Engineer. When permitted, such procedures shall be carried out in a manner which will not impair the capacity of the piles already in place or the safety of existing adjacent structures. If the Engineer determines that pre-augering has disturbed the capacities of previously installed piles, those piles that have been disturbed shall be restored to conditions meeting the requirements of this specification by redriving or by other methods acceptable to the Engineer. Redriving or other remedial measures shall be instituted after the pre-augering operations in the area have been completed.

3. Pile Capacity

(a) Ultimate Pile Capacity: Piles shall be driven by the Contractor to the penetration depth shown on the plans or to a greater depth if necessary to obtain the ultimate pile capacity. The ultimate pile capacity shall be as defined in the contract documents.

Jetting or other methods shall not be used to facilitate pile penetration unless specifically permitted in the contract documents or in writing by the Engineer. The ultimate pile capacity of jetted piles shall be based on driving resistances recorded during impact driving after the jet pipes have been removed. Jetted piles not attaining the ultimate pile capacity at the ordered length shall be spliced, as

required, at the Contractor's cost, and driven with an impact hammer until the ultimate pile capacity is achieved.

The ultimate pile capacity of piles driven with followers shall only be considered acceptable when the follower driven piles attain the same pile toe elevation or top of bedrock elevation as required for the full length piles driven without followers that attained the required ultimate pile capacity.

(b) Wave Equation: The ultimate pile capacity shall be determined by the Engineer. Piles shall be driven with the approved driving equipment to the ordered length or other lengths necessary to obtain the required ultimate pile capacity. Jetting or other methods to facilitate pile penetration shall not be used unless specifically permitted either in the contract documents or approved by the Engineer after a revised driving resistance is established from the wave equation analysis. Adequate pile penetration shall be considered to be obtained when the specified wave equation resistance criteria is achieved within 5 feet (1.5 meters) of the pile toe elevation, based on ordered length. Piles not achieving the specified resistance within these limits shall be driven to penetrations established by the Engineer.

(c) Static Load Tests: Compression load tests shall be performed by procedures set forth in ASTM D-1143 using the quick load test method, except that the test shall be taken to plunging failure or the capacity of the loading system. Testing equipment and measuring systems shall conform to ASTM D-1143, except that the loading system shall be capable of applying 150% of the ultimate pile capacity as stated in the contract documents, and that a load cell and spherical bearing plate shall be used. The apparatus shall be constructed to allow the various increments of the load to be placed gradually, without causing vibration to the test pile. The Contractor shall submit to the Engineer for approval working drawings of the loading apparatus in accordance with Article 1.05.02. When the approved method requires the use of tension (reaction) piles, the tension piles, when feasible, shall be of the same type and diameter as the production piles, and shall be driven in the location of permanent piles except that timber or tapered piles installed in permanent locations shall not be used as tension piles.

The top elevation of the test pile shall be determined immediately after driving and again just before load testing to check for heave. Any pile which heaves more than 1/4 inch (6 millimeters) shall be redriven or jacked to the original elevation prior to testing. Unless otherwise specified in the contract, a minimum 3-day waiting period shall be observed between the driving of any anchor piles or the load test pile and the commencement of the load test.

On completion of the load testing, any test or anchor piling not a part of the finished structure shall be removed or cut off at least 1 foot (300 millimeters) below either the bottom of footing or the finished ground elevation, if not located within the footing area.

(d) Dynamic Pile Driving Analysis (PDA) Test: Dynamic measurements following procedures set forth in ASTM D-4945 will be taken during the driving of piles designated as dynamic monitoring test piles. The Contractor shall employ a qualified specialty Consultant, which has successfully completed no less than ten

dynamic pile driving tests, to perform the testing and report preparation for all Dynamic Pile Driving Analysis (PDA) Tests to be performed.

At least thirty days prior to driving the test piles the Contractor shall submit to the Engineer for review and approval the qualified specialty consultant, as well as the complete installation, and testing procedures. The submittal shall include all necessary pile driving equipment and support facilities to drive the piles to capacities and depths shown on the plans within allowable stress limits. As part of the submittal the Contractor's Consultant shall perform a wave equation analyses, and a summary report confirming that the pile driving system proposed by the Contractor can meet the capacity, driving resistance and allowable stress limits.

All equipment necessary for the dynamic monitoring of the piles such as gages, cables, etc., shall be furnished by the Contractor's Consultant. The equipment shall conform to the requirements of ASTM D-4945, Standard Test Method for High Strain Dynamic Testing of Piles, and be capable of testing the pile to one and one-half times the ultimate pile capacity. An experienced engineer, who has successfully completed no less than ten dynamic pile driving tests, shall operate the Pile Driving Analyzer in the field. The Contractor shall furnish a shelter within 100 feet (30 meters) of test location(s) to protect the dynamic test equipment from the elements. The shelter shall be a minimum floor size of 400 square feet (40 square meters), with a minimum ceiling height of 7 feet (2 meters), and an inside temperature maintained between 50° and 85°F (10° and 29°C).

The Contractor shall provide power to the test pile locations for the duration of the dynamic testing. The power supply shall consist of a power source providing 115-Volt alternating current with a frequency of 60 Hz and a minimum of 2 kilowatts. If field generators are used as the power source, provide functioning meters to monitor power voltage and frequency. Direct current welders or non-constant power sources are unacceptable.

Prior to lifting the pile to be dynamically tested, the Contractor shall provide as a minimum 3 feet (1 meter) of clear access to 180 degree opposite faces of the pile for pile preparation. The Contractor or its Consultant shall then drill and prepare holes in the pile for gage attachment.

The Contractor or its Consultant shall attach the gages to the pile before driving the piles. Pile driving shall be performed using routine pile installation procedures. When the level of the gages is within 1 foot (300 millimeters) of the ground surface, or obstruction, driving shall be halted to remove the gages from the pile. If additional driving is required, the pile shall be spliced and gages shall be reattached to the head of the next pile segment.

With the dynamic testing equipment attached, the Contractor shall drive the pile to the design penetration depth or to a depth determined by the Engineer. The Engineer will use the ultimate pile capacity estimates at the time of driving and/or restriking from dynamic test methods to determine the required pile penetration depth for the ultimate pile capacity. The stresses in the piles will be monitored during driving with the dynamic test equipment to ensure that the actual driving stresses do not exceed the maximum allowed values. If necessary, the Contractor

shall reduce the driving energy transmitted to the pile by using additional cushions or reducing the energy output of the hammer in order to maintain driving stresses below the maximum values. If non-axial driving is indicated by dynamic test equipment measurements, the Contractor shall immediately realign the driving system.

After the initial drive of the pile, the Contractor shall wait 24 hours, or the time specified in the contract documents, and restrike the dynamic monitoring test pile with the dynamic testing instruments attached. A cold hammer shall not be used for the restrike. The hammer shall be warmed up before restrike begins by applying at least 20 blows to another pile. The maximum amount of penetration required during restrike shall be 6 inches (150 millimeters), or 50 hammer blows, whichever occurs first.

The Contractor's Consultant shall provide preliminary estimates of pile capacity of the test pile to the Engineer within 24 hours of the restrike of each tested pile. The Contractor's Consultant shall also prepare and submit a written report within 5 calendar days of the completion of the testing. This report shall contain a discussion of the pile capacity obtained from the dynamic testing. CAPWAP analyses of the dynamic testing data shall be performed on data obtained at the end of initial driving and the beginning of restrike. The Engineer may request additional analyses at selected pile penetration depths. The report shall also discuss hammer and driving system performance, driving stress levels, and pile integrity. The report is to be prepared, signed, sealed and dated by a Connecticut licensed Professional Engineer. No production piles can be driven until the report has been submitted and approved by the Engineer.

4. Test Piles and Order Lists: Test piles shall be driven at the locations shown on the plans and to the penetration depths specified by the Engineer. Test piles shall be driven to a driving resistance established by the Engineer at the estimated pile toe elevation. The Contractor shall excavate the ground at each test pile to the elevation of the bottom of the footing before the pile is driven. All test piles shall be driven with impact hammers unless specifically stated otherwise in the plans. In general, the specified length of test piles will be greater than the estimated length of production piles in order to provide for variation in soil conditions. The driving equipment used for driving test piles shall be identical to the equipment proposed for driving the production piling. Approval of driving equipment shall conform to the requirements of these Specifications.

Test piles that do not attain the specified driving resistance at a depth of 6 inches (150 millimeters) above the estimated pile tip elevation, or are specified as a dynamic monitoring pile, shall be redriven after being allowed to set up. The minimum time period before restrike shall be 24 hours, or as specified in the contract documents. A cold hammer shall not be used for the restrike. The hammer used shall be warmed up by applying at least 20 blows to another pile.

Unless otherwise specified in the contract documents, the Contractor shall not order piling to be used in the permanent structure until test pile data has been reviewed and pile order lengths are authorized by the Engineer. The Engineer will provide the pile order list after completion of the test pile(s) and dynamic pile driving analysis (PDA) tests and/or pile loading tests specified in the contract documents.

When no test piles are specified for a substructure, the estimated pile lengths in the contract documents are taken as the pile order length.

The lengths given in the order list will be based on the lengths which are assumed after cutoff to remain in the completed structure. The Contractor shall, without added compensation, increase the lengths to provide for fresh heading and for such additional length as may be necessary to suit the Contractor's method of operation.

5. Pile Preparation and Driving: The heads of all piles shall be plane and perpendicular to the longitudinal axis of the pile before the helmet is attached. Approval of a pile hammer relative to driving stress damage shall not relieve the Contractor of responsibility for piles damaged because of misalignment of the leads, failure of cushion materials, failure of splices, malfunctioning of the pile hammer, or other improper construction methods. Piles damaged for such reasons shall be rejected and replaced at the Contractor's expense when the Engineer determines that the damage impairs the strength of the pile.

If it becomes necessary and is authorized by the Engineer to resort to jetting, spudding or pre-holing — and further, if no contract bid price is asked for in the proposal for jetting, spudding, or pre-holing — such work will be paid for as "extra work" in accordance with Articles 1.04.05 and 1.09.04.

The use of a hammer with a greater mass, or the use of piles manufactured or designed with pile tips of a nature to provide for better penetration such as but not limited to composite shells, tapered sections or H-pile sections, shall not be considered as extra work. Authorized point reinforcement for piles shall be a separate item.

Piles for exposed pile bents shall be driven with pile driver leads and templates. They shall be of rigid design and construction and shall maintain the required position and alignment of the piles within the tolerances hereinafter specified. Templates shall be anchored or spudded into position, shall be capable of guiding all piles required for the bent and shall remain in place until all the piles in the bent are driven.

(a) Location and Alignment Tolerance: Piles shall be driven with a variation of not more than 1/4 inch per foot (20 millimeters/meter) from the vertical or from the batter line indicated, except that piles for trestle bents shall be so driven that the cap may be placed in its proper location without inducing excessive stresses in the piles. Upon completion of driving and released from leads, exposed piles such as in bents shall not have a variation of more than 2 inches (50 millimeters) at the cut-off elevation from the position shown on the plans. Unless otherwise permitted in writing by the Engineer, failure to meet this tolerance shall be cause for rejection. Other foundation piles shall not be out of the position shown on the plans more than 6 inches (150 millimeters) after driving. The Engineer may require that driving be stopped in order to check the pile alignment. Pulling laterally on piles to correct misalignment, or splicing a properly aligned section on a misaligned section shall not be permitted.

If the location and/or alignment tolerances specified are exceeded, the extent of overloading shall be evaluated by the Engineer. If in the judgment of the Engineer, corrective measures are necessary, suitable measures shall be designed and constructed by the Contractor.

(b) Heaved Piles: Level readings to measure pile heave after driving shall be made by the Contractor at the start of pile driving operations and shall continue until the Engineer determines that such checking is no longer required. Level readings shall be taken immediately after the pile has been driven and again after piles within a radius of 15 feet (4.5 meters) have been driven. If pile heave is observed, the Contractor shall take accurate level readings referenced to a fixed datum on all piles immediately after installation and periodically thereafter as adjacent piles are driven to determine the pile heave range. All piles that have been heaved more than ¼ inch (6 millimeters) shall be redriven at the Contractor's cost, to the required resistance or penetration. Concrete shall not be placed in pile casings until pile driving has progressed beyond a radius of 15 feet (4.5 meters) from the pile to be concreted. If pile heave is detected for pipe or shell piles which have been filled with concrete, the piles shall be redriven to original position after the concrete has obtained sufficient strength and a proper hammer-pile cushion system, satisfactory to the Engineer, is used.

(c) Installation Sequence: The order of placing individual piles in pile groups shall be either starting from the center of the group and proceeding outwards in both directions or starting at the outside row and proceeding progressively across the group.

6. Unsatisfactory Piles: The method used in driving piles shall not subject the piles to excessive or undue abuse producing crushing and spalling of concrete, injurious splitting, splintering, and brooming of the wood, or deformation of the steel. Misaligned piles shall not be forced into proper position. Any pile damaged during driving by reason of internal defects, or by improper driving, or driven out of its proper location, or driven below the designated cutoff elevation, shall be corrected by the Contractor by a method approved by the Engineer.

Piles which have been bent during installation shall be considered unsatisfactory unless the ultimate capacity is proven by load tests performed at the Contractor's expense. If such tests indicate inadequate capacity, corrective measures as determined by the Engineer shall be taken, such as use of bent piles at reduced capacity, installation of additional piles, strengthening of bent piles, or replacement of bent piles.

A concrete pile will be considered defective if a visible crack, or cracks, appears around the entire periphery of the pile, or if any defect is observed which, as determined by the Engineer, affects the strength or life of the pile.

7. Splicing Piles and Extensions: Full length piles shall be used when practicable; but if splices cannot be avoided, piles or shells for cast-in-place piles may be spliced in accordance with the requirements of the plans. Piles shall not be spliced except with the approval of the Engineer. Splices in excess of two per pile for timber, steel and cast-in-place concrete piles will not be permitted except with special permission of the Engineer. Only one splice per pile will be permitted in precast concrete or prestressed concrete piles. In the absence of splice details in the plans, piles or shells for cast-in-place concrete piles shall be spliced in accordance with the pile or shell manufacturer's recommendations, subject to the approval of the Engineer. Working Drawings for prefabricated splicing devices and their method of installation shall be submitted to the Engineer for review. All seams, joints and splices shall develop the full strength of the pile.

8. Point Reinforcement: When directed by the Engineer, the contractor shall point-reinforce piles. Such point-reinforcement shall be in accordance with the plans or as directed.

9. Cutoff Lengths: The pile head of all permanent piles and pile casings shall be cutoff at the elevation shown on the plans or as ordered by the Engineer. All cutoff lengths shall become the property of the Contractor, and shall be removed by the Contractor from the site of the work.

10. Painting Steel Piles and Steel Pile Shells: When steel piles or steel pile shells extend above the ground surface or water surface, they shall be painted as specified elsewhere in the contract documents or as ordered by the Engineer. This protection shall extend from an elevation 2 feet (600 millimeters) below the ground or water surface to the top of the exposed steel.

11. Welding on Piles: When required or permitted, all welding on piles shall be done in accordance with the requirements of the current AWS Structural Welding Code.

7.02.04—Method of Measurement

1. Steel Piles-Timber Piles-Precast Concrete Piles: The length of (type) piles which will be the basis for the pay computation to be included under the item of furnishing (type) piles, shall be number of linear feet (meters) of (type) piles authorized by the Engineer or actually furnished by the Contractor, whichever is the lesser amount.

Length of pile cutoffs previously paid for under authorized lengths of piles and subsequently incorporated into the work will not be measured for payment.

The work, materials, tools, equipment and labor incidental to the disposal of pile cutoffs will not be measured for payment.

The amounts to be included under the item for driving (type) piles will be the number of linear feet (meters) of piles actually driven and accepted in the completed structure.

2. Cast-in-Place Concrete Piles: The amount to be included under the item of cast-in-place concrete piles shall be the number of linear feet (meters) of piles actually driven and accepted in place in the completed structure.

Cut-off materials from shells shall remain the property of the Contractor. They will be paid for in accordance with the unit cost applying in the Contractor's bill or bills for such shells, except that no payment will be made of material cut off from shells furnished by the Contractor in excess of the ordered length. The unit of measurement will be the unit applying in the Contractor's bill or bills for such shells. Material cut off from shells furnished by the Contractor in lengths in excess of those ordered by the Engineer will not be measured for payment hereunder. The work, materials, tools, equipment and labor incidental to the disposal of cutoffs will not be measured for payment.

Reinforcement, if required in cast-in-place concrete piles, will not be measured for payment.

3. Prestressed Concrete Piles (Pretensioned): The length of the prestressed concrete piles, which will be the basis for the pay computation, shall be the number of linear feet (meters) of piles authorized by the Engineer or actually furnished by the Contractor, whichever is the lesser amount. The length of any specified pile tip protruding from the concrete will be included in the length measured for payment.

Also included in the length measured for payment will be the length of precast pile extensions ordered by the Engineer. Not to be included, however, is the length of pile extension furnished in excess of the ordered length. The length of projection dowels shall not be included in the length measured for payment.

Extensions to prestressed concrete piles which are poured monolithically with the footing or pier cap will be paid for at the Contract unit prices for the several items involved, which prices shall be full compensation for all materials, tools, equipment and labor necessary to the completion of the work.

Cut-offs shall not be used for pile extension. The work, material, tools equipment and labor incidental to the disposal of cutoffs will not be measured for payment.

The amounts to be included under the item for driving prestressed concrete piles shall be the number of linear feet (meters) of piles actually driven and accepted in the completed structure.

4. Test Piles: The amounts to be included under the respective items for test piles, of the type and length specified, shall be the number of test piles actually driven and accepted. Lengths of test piles ordered by the Engineer in excess of the length or lengths specified in the contract will be measured for payment by the actual number of linear feet (meters) ordered, furnished and accepted by the Engineer. Driving of such pile extensions will be measured for payment by the actual length driven and left in place.

Authorized splices performed on test piles will be measured for payment by the number of authorized splices actually completed and accepted. Splicing of test piles shall not be considered as authorized splices when such splicing is done to complete piles to the test pile length specified in the contract.

5. Static Load Tests: The amount to be included under the item of static loading tests shall be the actual number of static load tests completed and accepted.

6. Dynamic Pile Driving Analysis (PDA) Test: The amount to be included under this item shall be the actual number of piles which are driven and restruck with dynamic monitoring equipment attached, completed and accepted

7. Splices: The amount to be included under the items for splicing timber, steel, cast-in-place concrete, precast concrete and prestressed concrete piles (pretensioned) shall be the number of authorized pile splices actually completed and accepted. The splicing of timber and steel piles, steel shells for cast-in-place concrete piles, precast concrete piles and prestressed concrete piles (pretensioned) shall not be considered as authorized splices when such splicing is performed to complete piles to the order lengths, as defined in Subarticle 7.02.03-7, or when the furnished lengths of such piles are less than the order lengths approved by the Engineer.

8. Point Reinforcement for Piles: The amount to be included under the item of "Point Reinforcement for Piles" for the type of piles specified shall be the number of authorized reinforced points actually completed and accepted.

9. Pre-Augering of Piles: The amount to be included under the item "Pre-Augering of Piles" shall be the number of linear feet (meters) of pre-augering completed and accepted by the Engineer.

7.02.05--Basis of Payment: This work will be paid for as follows:

1. Steel Piles: Payment for furnishing steel piles of the lengths authorized will be at the Contract unit price per pound (kilogram) for "Furnishing Steel Piles," which price shall include furnishing, delivery, storage and handling, and all materials, equipment, tools and labor incidental thereto. The weight (mass) of steel pile caps will be included with and paid for under this item.

Payment for driving steel piles will be at the contract unit price per linear foot (meter) for "Driving Steel Piles," complete in place, which price shall include all materials, equipment, tools and labor incidental thereto.

2. Timber Piles: Payment for furnishing timber piles or treated timber piles, up to a length 10 feet (3 meters) greater than that specified on the plans or in the proposal form, will be at the Contract unit price per foot (meter) for "Furnishing Timber Piles (' Length)" and "Furnishing Treated Timber Piles (' Length)," respectively, which price shall include furnishing, delivery, peeling, storage and handling, and all materials, equipment, tools and labor incidental thereto.

In case the length of any piles finally ordered is more than 10 feet (3 meters), but less than 20 feet (6 meters), greater than the length specified on the plans or proposal form, payment for furnishing such piles shall be at a price per linear foot (meter) equal to the original contract price, plus 20 percent thereof.

In case the length of any piles finally ordered is 20 feet (6 meters) or more greater than the length specified on the plans or proposal form, payment for furnishing such piles shall be at a price per linear foot (meter) equal to the original contract price plus 40 percent thereof.

Payment for driving timber piles or treated timber piles will be at the contract unit price per linear foot (meter) for "Driving Timber Piles" and "Driving Treated Timber Piles," respectively, complete in place and regardless of length, which price shall include all materials, equipment, tools and labor incidental thereto.

3. Cast-in-Place Concrete Piles: Payment for cast-in-place concrete piles will be at the contract unit price per linear foot (meter) for "Cast-in-Place Concrete Piles," complete in place, including all materials, equipment, tools and labor incidental thereto.

Cut-off materials from shells shall remain the property of the Contractor. They will be paid for in accordance with the unit cost applying in the Contractor's bill or bills for such shells, except that no payment will be made for material cut off from shells furnished by the Contractor in excess of the ordered length.

4. Prestressed Concrete Piles: Payment for furnishing prestressed concrete piles, of the lengths required, will be at the contract unit price per linear foot (meter) for "Furnishing Prestressed Concrete Piles" of the type and size as shown on the plans, which price shall include furnishing, delivery, storage and handling, and all materials, equipment, tools and labor incidental thereto.

Payment for driving prestressed concrete piles will be at the contract unit price per linear foot (meter) for "Driving Prestressed Concrete Piles," complete in place, which price shall include all material, equipment, tools and labor incidental thereto. Also included shall be all work involved in cutting piles to the direct cut-off elevation.

5. Test Piles: Test piles will be paid for at the contract unit price each for "Test Pile," of the type and length specified, which price shall constitute the complete compensation for furnishing and driving test piles and shall include all materials, equipment, tools and labor incidental thereto. Authorized splices to test piles will be paid for at 200 percent of the contract unit price bid for Splicing Timber Piles, Splicing Steel Piles, Splicing Cast-in-Place Piles or Splicing Prestressed Concrete Piles, whichever type of test pile the splice has been performed on; and such payment shall be for all costs including materials, equipment, tools and labor incidental thereto.

Extension to test piles in excess of the specified length will be paid for on the following basis, which shall include all equipment, tools, splices, labor and work incidental thereto.

(a) Timber Test Piles: Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Furnishing Timber Piles," of the shortest length specified in the proposal, and at 125 percent of the contract unit price per linear foot (meter) for "Driving Timber Piles."

(b) Steel Test Piles: Extensions will be paid for at 125 percent of the contract unit price per pound (kilogram) for "Furnishing Steel Piles" and at 125 percent of the contract unit price per linear foot (meter) for "Driving Steel Piles."

(c) Cast-in-Place Concrete Test Piles: Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Cast-in-Place Concrete Piles." Cut-off materials from shells will be paid for as provided in Subarticle 7.02.05-3.

(d) Prestressed Concrete Test Piles: Extensions will be paid for at 125 percent of the contract unit price per linear foot (meter) for "Furnishing Prestressed Concrete Piles," and at 125 percent of the contract unit price per linear foot (meter) for "Driving Prestressed Concrete Piles."

6. Static Load Tests: Loading tests will be paid for at the contract unit price each for "Pile Loading Test," which price shall include all expenses incidental to loading the pile or group of piles and removing the load, platform, etc., upon completion of the test.

7. Dynamic Pile Driving Analysis (PDA) Test: Dynamic monitoring will be paid for at the contract unit price each for "Dynamic Pile Driving Analysis (PDA) Test" which price shall include complete compensation for each pile tested using a pile driving analyzer during driving and restrike, including all materials, equipment, tools and labor incidental thereto, as well as providing preliminary and summary report(s).

8. Splices: Authorized splices in timber, steel, cast-in-place piles, precast concrete and prestressed concrete piles will be paid for at the contract unit price each for "Splicing Timber Piles," "Splicing Steel Piles," "Splicing Cast-in-Place Concrete Piles," "Splicing Precast Concrete Piles," "Splicing Prestressed Concrete Piles," respectively, which price shall include all materials, except as otherwise noted, and all equipment, tools and labor incidental thereto. In the absence of such prices, authorized splices will be paid for as extra work.

9. Trimming and Cutting: There shall be no direct compensation for cutting off timber, steel, precast concrete or prestressed concrete piles and shells for cast-in-place concrete piles as ordered; but the cost thereof shall be considered as included in the cost of the pile items.

10. Point Reinforcement for Piles: Authorized points for pointing and reinforcing piles will be paid for at the contract unit price each for "Point Reinforcement for Timber Piles," or "Point Reinforcement for Steel Piles," respectively, whichever applies, which price shall include all materials, equipment, tools and labor incidental thereto. In the absence of such prices, authorized points will be paid for as extra work.

11. Pre-Augering of Piles: Payment for "Pre-Augering of Piles" will be at the contract unit price per linear foot (meter) for "Pre-Augering of Piles," which price shall include which price shall include all materials, and all equipment, tools and labor incidental thereto.

12. Underground Obstructions: If the required pile penetration is not reached due to the presence of underground obstructions which are not the result of the Contractor's operations but are due to the presence of earlier construction at the site, then the cost of removing these obstructions and back-filling the area will be paid for as extra work unless otherwise specified in the contract documents.

13. Painting: There will be no additional payment for painting steel piles and steel pile shells, but the cost thereof shall be considered as included in the cost of furnishing and driving the piles.

14. Disposal of Pile Cutoffs: All costs incidental to the disposal of cutoff material will be included in the price of furnishing of the type of pile specified.

Pay Item	Pay Unit
Furnishing (Type) Piles (Lengths)	lb. (kg)
Driving (Type) Piles	l.f. (m)
Test Pile (Type-Length)	ea. (ea.)
Splicing (Type) Piles	ea. (ea.)
Point Reinforcement for (Type) Piles	ea. (ea.)
Pile Loading Test	ea. (ea.)
Dynamic Pile Driving Analysis (PDA) Test	ea. (ea.)
Pre-Augering of Piles	l.f. (m)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 7.06
MICROPILES**

Add the following section:

**SECTION 7.06
MICROPILES**

- 7.06.01 – Description**
- 7.06.02 – Materials**
- 7.06.03 – Construction Methods**
- 7.06.04 – Method of Measurement**
- 7.06.05 – Basis of Payment**

7.06.01 - Description: This work shall consist of constructing micropiles in accordance with the Contract. The Contractor is responsible for furnishing all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision required for design, installation and testing of micropiles and micropile top attachments for this Project.

The Contractor shall select the micropile type, size, pile-top attachment, installation means and methods, and shall estimate the grout-to-ground bond value(s) and determine the required grout bond length and final micropile diameter.

The Contractor shall design and install micropiles that will develop the load capacities indicated on the plans. The micropile load capacities shall be confirmed by verification and proof-load testing as required and must meet the test acceptance criteria specified herein. The Contractor's micropile design shall conform to requirements set forth in this specification and to micropile design minimums/maximums shown on the Contract drawings.

7.06.02 - Materials: Furnish new materials without defects. Materials for micropiles shall comply with the following:

- 1. Admixtures for Grout:** Admixtures shall comply with Article M.03.01 hereof. Accelerators are not permitted. Expansive admixtures and admixtures containing chlorides are not permitted.
- 2. Cement:** Cement shall conform to ASTM C 150/AASHTO M85, Types II, III or V.
- 3. Centralizers and Spacers:** Centralizers and spacers shall be fabricated from Schedule 40 PVC pipe.
- 4. Grout:** Grout shall consist of neat cement or fine aggregate/cement mixture meeting the three (3) and twenty-eight-(28-)day required compressive strengths specified in the Contract. The grout shall conform to AASHTO T106/ASTM C109 and to any minimum and

maximum properties shown on the plans or in Article M.03.05.

- 5. Permanent Casing Pipe:** Permanent steel casing or steel pipe shall conform to required minimum and maximum properties shown on the plans. The steel casing or steel pipe shall comply with one or more of the following specifications: ASTM A252 or A106, or API N-80.
- 6. Reinforcing Bars:** Reinforcing steel shall be deformed bars in accordance with ASTM A615/AASHTO M31. Continuous spiral deformations (*i.e.*, continuous thread bars) shall be used for same. Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
- 7. Encapsulation:** Encapsulation (double corrosion protection) shall be shop-fabricated using high-density, corrugated polyethylene tubing complying with the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.03 in (0.8 mm). The inside annulus between the reinforcing bar(s) and the encapsulation tube shall measure a minimum 0.2 in (5 mm) and be fully grouted with non-shrink grout conforming to Section M.03.

7.06.03 - Construction Methods:

- 1. Contractor's Experience Requirements:** The micropile Contractor shall be experienced in the construction and load testing of micropiles, having successfully constructed at least five (5) projects in the last five (5) years involving construction totaling at least one hundred (100) micropiles of capacity similar to that required of the ones in these plans and Specifications.

The Contractor shall have previous micropile drilling and grouting experience in soil/rock conditions similar to those on this Project. The Contractor shall submit construction details, structural details and load test results for at least three (3) previous successful micropile load tests from different projects similar in scope to this Project.

The Contractor shall assign or hire a professional engineer, licensed in the State of Connecticut, to supervise the micropile work. That engineer shall have experience on at least ten (10) projects of similar scope to this Project, completed over the past five (5) years. The Contractor shall not use manufacturers' representatives to satisfy the supervising engineer requirements of this Section. The Contractor may use a single independent consultant for this purpose, provided that the consultant has specific experience as described above and operates specifically for the purpose of transferring technology and skills in micropiling to contractors. The on-Site foremen and drill rig operators shall also have experience on at least ten (10) projects over the past five (5) years installing micropiles of equal or greater capacity than is required in these plans and Specifications.

The Contractor shall assign or hire a professional engineer, licensed in the State of Connecticut, to design the micropiles. This engineer shall have experience in the design of at least three (3) successfully-completed micropile projects over the past five (5) years, with micropiles of capacity similar to that required in these plans and specifications. This engineer shall also be responsible for design, supervision and reporting of the verification and proof test(s).

At least forty-five (45) calendar days before the planned start of micropile construction, the Contractor shall submit five (5) copies of the completed Project reference list and a personnel list. The Project reference list shall include a brief Project description with the owner's name and current phone number and load test reports. The personnel list shall identify the supervising Project Engineer, drill rig operators, and on-Site foremen to be assigned to this Project by the Contractor. The personnel list shall contain a summary of each individual's experience and be complete enough for the Engineer to determine whether each individual has the required qualifications.

Work shall not start, nor materials be ordered, until the Engineer gives written approval of the Contractor's experience qualifications. The Engineer may suspend work if the Contractor uses non-approved personnel on the Project. If work is suspended for that reason, the Contractor shall be fully liable for all resulting costs, and Department will not make any Contract time adjustments because of the suspension.

2. Micropile Design Requirements and Submittals: The micropiles shall be designed to meet the specific loading conditions, as shown on the plans and approved working drawings. The micropile design shall conform to all required minimum and maximum properties shown on the plans, the "American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications" (including the latest Interims), and the "Connecticut Department of Transportation Bridge Design Manual."

Where called for on the plans, the Contractor shall provide corrosion protection of the internal steel reinforcing bars, consisting of encapsulation, epoxy coating or grout. Where the permanent casing is used for a portion of the micropile, the corrosion protection shall extend at least 5 ft (1.5 m) into the casing. Steel pipe used for micropile permanent casing shall incorporate an additional 1/16 in (1.6 mm) thickness of sacrificial steel for corrosion protection.

The Contractor shall submit working drawings in accordance with Section 1.05 to the Engineer. The working drawings shall include all information required for the design, plans, construction and quality control of the micropile installation. The information shall include, but not necessarily be limited to, the following;

(a) Design Computations

- I. A written summary report describing the overall micropile design.
- II. A statement of applicable code requirements and design references.
- III. Micropile structure critical design cross-section(s) geometry, including soil/rock strata and piezometric levels and location, magnitude and direction of applied loadings, including slope or external surcharge loads.
- IV. A description of design criteria to be applied to the work, including, soil/rock shear strengths (friction angle and cohesion), unit weights, and grout-to-ground bond value(s) and micropile drill-hole diameter assumptions for each soil/rock stratum.
- V. A statement of Resistance/Load factors used in the design of the grout-to-ground

bond value(s), surcharges, soil/rock and material unit weights, steel, grout and concrete materials.

- VI. Design calculation sheets with the Project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page. Provide an index page for the design calculations.
- VII. Design notes including a list of symbols and computer program used in the design.
- VII. Pile-to-footing connection calculations.

(b) Plans

- I. A plan view of the micropile structures providing:
 - i. A reference baseline and elevation datum.
 - ii. The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.
 - iii. Beginning and end of micropile structure stations.
 - iv. Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned utilities, adjacent structures or other potential interference; and the centerline of any drainage structure or drainage pipe behind, passing through or passing under the micropile structure.
 - v. Subsurface exploration locations shown on the plan view of the proposed micropile structure alignment with appropriate reference baselines to fix the locations of the exploration relative to the micropile structure.
- II. An elevation view of the micropile structure(s) providing:
 - i. Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).
 - ii. Existing and finished grade profiles both behind and in front of the micropile structure.
- III. Design parameters and applicable codes.
- IV. General notes for constructing the micropile structure, including construction sequencing or other special construction requirements.
- V. Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.
- VI. A listing of the summary of quantities on the elevation drawing of each micropile structure, showing pay item estimated quantities.

- VII. Micropile typical sections, including micropile spacing and inclination; minimum drill-hole diameter; pipe casing and reinforcing bar size and details; splice type and locations; centralizers and spacers; grout bond zone and casing plunge length (if used); corrosion protection details; and connection details to the substructure footing, anchorages and plates.
- VIII. A typical detail of verification and production proof test micropiles defining the micropile length, minimum drill-hole diameter, inclination, and load test bonded and unbonded test lengths.
- IX. Details, dimensions and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
- X. Details for constructing micropile structures around drainage facilities (if applicable).

(c) Construction Procedures

- I. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to ensure quality control. This step-by-step procedure shall be shown in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.
- II. Proposed start date, time schedule and micropile installation schedule providing the following:
 - i. Micropile number.
 - ii. Micropile design load.
 - iii. Type and size of rebar.
 - iv. Minimum total bond length.
 - v. Total micropile length.
 - vi. Micropile top footing attachment.
- III. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.
- IV. Information on space requirements for installation equipment that verify the proposed equipment can perform at the Site.
- V. Proposed plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed. This will include computations showing that the proposed equipment used for flushing the micropile during installation (*i.e.*, pumps for water flushing and compressors for air flushing) will maintain up-hole (flushing) velocities necessary to ensure that all of the flush and drill cuttings are returned up through the annulus between the drill rod and casing.

- VI. Certified mill test reports for the reinforcing steel and for permanent casing. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
- VII. Proposed Grouting Plan. The grouting plan shall include complete descriptions, and details for the following:
- a. Grout mix design and type of materials to be used in the grout, including certified test data and trial batch reports. The Contractor shall also provide specific gravity of the wet mix design.
 - b. Methods and equipment for accurately monitoring and recording the grout depth and grout volume as the grout is being placed.
 - c. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one (1) year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accordance with Article M.03.05.
 - d. Procedure and equipment for Contractor monitoring of grout quality. At a minimum, the Contractor shall be required to use a Baroid Mud Balance (per API RP-13B-1) to check the specific gravity of the mixed grout prior to placement into each drilled micropile.
- (d) Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with this Specification.
- (e) Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory within ninety (90) calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

Work shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Engineer. Any submittals found to be unacceptable by the Engineer shall be revised, resubmitted and accepted prior to commencing work.

- 3. Pre-construction Meeting:** A pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Engineer, prime Contractor, micropile specialty Contractor and micropile design engineer shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted in order to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities among the prime Contractor and the various subcontractors - specifically those pertaining to

excavation for micropile structures, installation of temporary sheeting, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and Site drainage control.

- 4. Site Drainage Control:** The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with Section 1.10, any related Special Provisions in the Contract, and all applicable codes and regulations. Drill flush shall be conveyed by pipe, hose or conduit away from the location where the micropile is being drilled and away from any adjacent structure or facility. The Engineer will determine the acceptable distance required to convey the drill flush away from the micropile location. The Contractor shall provide positive control and discharge of all surface water that will affect construction of the micropile installation; maintain all pipes or conduits used to control surface water during construction; and repair any damage caused by surface water at no additional cost to the Department. Upon substantial completion of the work, the Contractor shall remove surface water control pipes or conduits from the Site. Alternatively, with the approval of the Engineer, the Contractor may leave pipes or conduits in place if fully grouted.

The Contractor shall immediately contact the Engineer if unanticipated existing subsurface drainage structures or other utilities are discovered during excavation or drilling; and shall suspend work in such areas until remedial measures meeting the Engineer's approval are implemented.

5. Micropile Allowable Construction Tolerances:

- (a) Centerline of piling shall not be more than 3 in (75 mm) from indicated plan location. Centerline of reinforcing steel shall not be more than 0.5 in (13 mm) from the centerline of the pile.
- (b) Pile shall be plum or battered within two percent (2%) of total-length plan alignment.
- (c) Top elevation of pile shall be plus 1 in (25 mm) or minus 1 in (25 mm) maximum from vertical elevation indicated.

- 6. Micropile Installation:** The micropile Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for installation of the micropiles. The micropile Contractor shall also determine the micropile casing size, final drill-hole diameter and bond length, and central tendon reinforcement steel size necessary to develop the specified load capacities and load testing requirements. All micropile material properties and dimensions shall conform to minimum/maximum properties and dimensions as shown in the Contract drawings. The micropile Contractor is also responsible for estimating the grout take. The Department will make no extra payment for grout overruns.

Should the plans require uncased drilling of the micropile into bedrock, the permanent or temporary casing shall be drilled a minimum 6 in (150 mm) into ledge or to a depth within the ledge so as to prevent subsidence of overburden into the uncased and bonded zone portion of the drill-hole (*i.e.*, the rock socket). The plans show estimated permanent casing lengths for each substructure unit. Any difference in the required length of permanent casing accepted by the Engineer from the estimated lengths shown on the plans shall be

measured for payment and credit. The Department will make no payment for differences in required length of temporary casing.

The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to the overburden, any overlying or adjacent structures, buried structures, utilities or services. If called for in the drilling method description, or by the nature of the stratum to be drilled through, the micropile Contractor shall furnish an overburden casing of the type and thickness that can be installed without distortion. Casings that fail, fracture, or otherwise distort during drilling or after drilling shall, unless otherwise directed, be withdrawn or replaced at the micropile Contractor's expense. The drill-hole must be open along its full length to at least the design minimum drill-hole diameter prior to placing grout and reinforcement.

Temporary casing or other approved method of pile drill-hole support will be required in caving or unstable ground in order to permit the pile shaft to form a drill hole of the minimum design diameter. The Contractor's proposed method(s) to provide drill-hole support and to prevent detrimental ground movements must be reviewed by the Engineer in advance of its use. Detrimental ground movement is defined as movement that requires remedial repair measures, in order to maintain Site conditions as determined by the Engineer.

Drilling and flushing methods shall be selected by the Contractor. Use of drilling fluid containing bentonite or any other non-reverting drilling fluid, however, is not allowed. The drilling and flushing system chosen by the Contractor shall be capable of providing the necessary up-hole velocity so as to ensure that all the flush and drill cuttings are returned up through the annulus between the drill rod and casing. The flush must not be allowed to escape in an uncontrollable fashion into the soil and rock formations outside the casing. The return flush must never be blocked or suppressed within the casing on its way back to the surface. The Contractor shall monitor and modify, as needed, the flush velocity and other elements of its drilling methods that could contribute to return of flush outside the casing. When return of flush is substantially lost during drilling, the Contractor shall halt drilling operations and immediately notify the Engineer of the situation.

During construction, the Contractor shall observe the ground conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence, and must immediately notify the Engineer if signs of movements are observed. The micropile Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged because of the drilling or grouting. If the Engineer determines that the movements require corrective action, the micropile Contractor shall take corrective actions necessary to stop the movement or perform repairs.

Reinforcement may be placed prior to grouting the drill-hole. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile reinforcement groups, if used, shall be sufficiently strong to withstand the installation and grouting process without damage or disturbance.

The micropile Contractor shall check pile-top elevations and adjust all installed micropiles to the planned elevations.

Centralizers and spacers shall be provided at 10 ft (3 m) on center maximum spacing. The uppermost and lowest centralizers shall be located a maximum of 3 ft (0.9 m) from the top and bottom of the micropile. Centralizers and spacers shall be securely attached to the reinforcement, sized to position the reinforcement within 1/2 in (12 mm) of plan location from center of pile, sized to allow grout tremie pipe insertion to the bottom of the drill-hole, and must be of sufficient size to allow grout to flow freely up the drill-hole, up the casing, and between adjacent reinforcing bars. The reinforcing steel shall be inserted into the drill-hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The micropile Contractor shall re-drill and reinsert reinforcing steel when necessary in order to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner that prevents eccentricity or an angle between the axes of the lengths to be spliced. Splices and threaded joints shall meet the requirements of the rebar material. Threaded pipe casing joints shall be located at least two (2) casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1 ft (0.3 m).

Micropiles shall be grouted on the same day that the load transfer bond length is drilled. The grouting equipment used shall be a colloidal grout plant and shall produce a grout free of lumps and undispersed cement. Paddle type mixers are not acceptable. The micropile Contractor shall have means and methods of measuring the grout quantity and pumping pressures during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressure. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauge shall be capable of measuring pressures of at least 145 psi (1000 kPa) or two (2) times the actual grout pressure used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one (1) hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill-hole, and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow stem augers or drill rods. Temporary casing, if used, shall be extracted in stages so as to ensure that, after each length of casing is removed, the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drill-hole. The grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

If the Contractor elects to use a post-grouting system, working drawings and details shall be submitted to the Engineer for review in accordance with Section 1.05.

Grout within the micropile verification and proof test piles shall attain the minimum required three-(3-)day compressive strength prior to load testing. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one (1) set of three (3) each 2 in (50 mm) grout cubes, or 3 in (75 mm) cylinders, from each grout plant each day of operation, or per every ten (10) micropiles, whichever occurs more frequently. The compressive strength shall be the average of the three (3) cubes or cylinders tested.

Grout consistency as measured by grout density shall be determined by the micropile Contractor per API RP-13B-1 at a frequency of at least one (1) test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout.

Provide grout cube or cylinder compressive strength and grout density test results to the Engineer within twenty-four (24) hours of testing.

- 7. Micropile Installation Records:** The micropile Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one (1) work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be provided for each micropile.
- 8. Verification and Proof Tests:** The Contractor shall perform verification and proof testing of piles at the locations specified on the plans, and perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein. If the Contractor designs micropiles using tip resistance, it shall use ASTM 1143 for verification and proof tests thereof.

The Contractor shall perform pre-production verification pile load test(s) to verify the design of the pile system and the construction methods proposed prior to installing any production piles. Sacrificial verification test pile(s) shall be constructed by the Contractor in conformance with the approved working drawings, and shall install verification test pile(s) at the location(s) shown on the plans or at location(s) approved by the Engineer.

Verification load test(s) shall be performed in order to verify that the micropiles installed by the Contractor will meet the compression and tensile load capacities and load test acceptance criteria, and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor's design and installation methods.

The drilling method, grouting method, permanent casing length, micropile diameter (cased and uncased) and bond zone length for the verification test pile shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.

The maximum verification and proof test loads applied to the micropile shall not exceed eighty percent (80%) of the structural capacity of the micropile structural elements, including steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification and proof test pile elements above the strength required for the production piles shall be provided for in the Contractor's bid price.

Testing equipment used in connection with the micropiles shall include dial gauges, dial gauge independent reference frame, jack and pressure gauge, electronic load cell (with readout device), and a reaction frame. The load cell is required only for the creep test portion of the verification test. The Contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves as outlined in the Submittals Section.

The Contractor shall design the testing reaction frame to be sufficiently rigid and of adequate dimensions to ensure that excessive deformation of the testing equipment does not occur; and must align the jack, bearing plates, and stressing anchorage so that unloading and repositioning of the equipment will not be required during the test.

The Contractor shall also apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi (690 kPa) increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. The Contractor shall monitor the creep-test-load-hold during verification tests with both the pressure gauge and the electronic load cell; and shall use the load cell in order to accurately maintain a constant load hold during the creep-test-load-hold increment of the verification test.

The Contractor shall measure the pile top movement with a dial gauge capable of measuring to 0.001 in (0.025 mm). The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge; and the Contractor shall visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. The Contractor shall also use a minimum of two (2) dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.

The Contractor shall test verification piles to the following loads: Alignment Load ("AL"), Maximum Service Limit Pile Load ("SVL") and the Ultimate Pile Capacity ("UPC"). The SVL and UPC loads are provided on the Contract drawings. The AL is the minimum load applied to the micropile during testing needed to keep the testing equipment correctly positioned. The AL shall not exceed five percent (5%) of the SVL. The verification pile load tests shall be made by incrementally loading the micropile in accordance with the cyclic load schedule shown in Table 7.06-1, for both compression and tension loading (test the compression prior to tension).

Table 7.06-1, Cyclic Load Schedule for Verification Pile Load Test

Step	Loading	Applied Load	Hold Time (minutes)
1	Apply AL	AL	2.5
2	Cycle 1	0.15 SVL	2.5
		0.30 SVL	2.5
		0.45 SVL	2.5
		0.60 SVL	2.5
		0.75 SVL	2.5
		0.90 SVL	2.5
		1.00 SVL	10 to 60 minutes
		0.60 SVL	2.5
		0.30 SVL	2.5
		AL	
3	Cycle 2	0.075 UPC	2.5
		0.150 UPC	2.5
		0.225 UPC	2.5
		0.300 UPC	2.5
		0.375 UPC	2.5
		0.450 UPC	2.5
		0.525 UPC	2.5
		0.600 UPC	2.5
		0.675 UPC	2.5
		0.750 UPC	2.5
		0.825 UPC	2.5
		0.900 UPC	2.5
		1.000 UPC	10 to 60 minutes
		0.750 UPC	2.5
		0.525 UPC	2.5
		0.225 UPC	2.5
		AL	

Pile-top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Pile movement during the 1.00 SVL and 1.000 UPC loads shall be measured and recorded at 1,2,3, 4, 5, 6, 10, 20, 30, 50, and sixty (60) minutes. The alignment load shall not exceed five percent (5%) of the SVL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile verification load test are:

- (a) The Engineer shall determine the criteria for tolerable movement during the load test at the top of the micropile.
- (b) At the end of the maximum test load increment for each cycle, test piles shall have a creep rate not exceeding 0.05 in (1.3 mm) /log cycle time (1 to 10 minutes) or 0.1 in (2.5 mm) /log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the hold period.

- (c) Failure does not occur at any load increment up to and including the maximum test load for each cycle. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.

Upon completion of the test, the Contractor shall prepare and submit a report of the test results, stamped by a professional engineer, for review and acceptance by the Engineer prior to beginning installation of production micropiles. This report shall include written confirmation of the verification micropile's capacity.

If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes of the structure shall be submitted as a revision to the working drawings and require the Engineer's review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, the Contractor shall remove test piles down to the elevation specified by the Engineer.

The Contractor shall perform proof load tests at the micropile locations as shown on the plans, and shall perform proof-load tests on the first set of production piles installed at each designated substructure unit prior to the installation of the remaining production piles in that unit. The initial proof-test piles shall be installed at the locations shown on the plans. Upon completion of each test, the Contractor shall prepare and submit a report of the test results, stamped by a professional engineer, for review and acceptance by the Engineer

The Contractor shall test proof test piles to a maximum test load of 1.00 times the Maximum Strength Limit Pile Load (STL). The STL load is provided on the Contract drawings. Proof tests shall be made by incrementally loading the micropile as shown in Table 7.06-2, to be used for both compression and tension loading:

Table 7.06-2, Incremental Loading for Proof Test Piles

Step	Loading	Applied Load	Hold Time (minutes)
1	Apply AL		2.5
2	Cycle 1	0.15 STL	2.5
		0.30 STL	2.5
		0.45 STL	2.5
		0.60 STL	2.5
		0.75 STL	2.5
		0.90 STL	2.5
		1.00 STL	10 to 60 minutes
		0.60 STL	2.5
		0.30 STL	2.5
		AL	

Depending on performance, either a ten-(10-)minute or sixty-(60-)minute creep test shall be performed at the 1.00 STL test load. Where the pile top movement between one (1) and then (10) minutes exceeds 0.039 in (1 mm), the Maximum Test Load shall be

maintained an additional fifty (50) minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. The alignment load shall not exceed five percent (5%) of STL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile proof load tests are:

- (a) The Engineer shall determine the criteria for tolerable movement during the load test at the top of the micropile.
- (b) At the end of the 1.00 STL test load increment, test piles shall have a creep rate not exceeding 0.05 in (1.3 mm) /log cycle time (1 to 10 minutes) or 0.1 in (2.5 mm) /log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep-load hold period.
- (c) Failure does not occur at the 1.00 STL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than fifty percent (50%) of the maximum load attained, post-grouting the tested pile and re-proof testing the pile, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes of the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification or proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

7.06.04 - Method of Measurement:

- 1. Micropiles** will be measured for payment by the number of micropiles installed and accepted. There will be no separate measurement or payment for furnishing the design of the micropiles or developing installation methods to meet these Specifications.
- 2. Verification Test for Micropiles** will be measured for payment by the number of verification tests performed on sacrificial micropiles.
- 3. Proof Test for Micropiles** will be measured for payment by the number of proof tests performed on production micropiles.
- 4. Micropile Length Adjustment** will be measured for payment by the length in linear feet (meter) of the difference between the estimated length of permanent casing, as shown on the plans, and the actual length of permanent casing installed and accepted by the Engineer. (Note that the permanent casing length is measured from the bottom of the pile cap to the permanent casing tip, including the required embedment of casing into rock. Embedment into the pile cap will not be measured for payment because it is considered incidental to micropile construction. Any increase in casing length will be measured for

payment to the Contractor, and any decrease in casing length will be measured for credit to the State.)

There will be no separate measurement or payment for mobilization and demobilization associated with this item.

7.06.05 - Basis of Payment:

- 1. Micropiles** will be paid for at the Contract unit price each for “Micropiles” complete and accepted in place, including all design, development of installation methods, materials, equipment, tools, proper disposal of drilling spoil and labor incidental thereto.
- 2. Verification Test for Micropiles** will be paid for at the Contract unit price each for “Verification Test for Micropiles” completed on sacrificial micropiles, including all materials, testing equipment, tools, test reports, removal of test piles and labor incidental thereto.
- 3. Proof Test for Micropiles** will be paid for at the Contract unit price each for “Proof Test for Micropiles” completed on production micropiles, including all materials, testing equipment, tools, test reports and labor incidental thereto.
- 4. Micropile Length Adjustment** will be paid for at the Contract unit price per linear foot (meter) for “Micropile Length Adjustment” complete and accepted, including all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Micropiles	ea. (ea.)
Verification Test for Micropiles	ea. (ea.)
Proof Test for Micropiles	ea. (ea.)
Micropile Length Adjustment	l.f. (m)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 8.22
TEMPORARY PRECAST CONCRETE BARRIER CURB**

8.22.04 – Method of Measurement:

Add the following sentence to the end of the second paragraph:

“Relocation of Temporary Precast Concrete Barrier Curb for access to the work area or for the convenience of the Contractor shall be considered incidental to Maintenance and Protection of Traffic and will not be measured for payment.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.10
METAL BEAM RAIL**

9.10.02 – Materials:

Change Subarticles 1 and 2 as follows:

- “ 1. Chemical anchoring material shall meet the requirements of Article M.03.07.
2. Metal beam rail delineators shall meet the requirements of Article M.18.09 and Article M.18.13.”

9.10.04 – Method of Measurement:

1 – Metal Beam Rail (Type)

Delete the only sentence and replace with the following:

“The length of metal beam rail measured for payment will be the number of linear feet (meters) of accepted rail of the type or designation installed, including radius rail other than Curved Guide Rail Treatment, measured along the top of rail between centers of end posts in each continuous section.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.18
THREE CABLE GUIDE RAILING
(I-BEAM POSTS) AND ANCHORAGES**

9.18.03 – Construction Methods:

In the 10th paragraph, replace “MIL” with “MILSPEC.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.22
BITUMINOUS CONCRETE SIDEWALK
BITUMINOUS CONCRETE DRIVEWAY**

9.22.03 – Construction Methods:

Replace the first paragraph with the following:

“1. Excavation: Excavation, including saw cutting, removal of any existing sidewalk, or driveway, shall be made to the required depth below the finished grade, as shown on the plans or as directed by the Engineer. All soft and yielding material shall be removed and replaced with suitable material.”

9.22.05 – Basis of Payment:

Replace the only paragraph with the following:

“This work will be paid for at the contract unit price per square yard (square meter) for "Bituminous Concrete Sidewalk" or "Bituminous Concrete Driveway," as the case may be, complete in place, which price shall include all saw cutting, excavation as specified above, backfill, disposal of surplus material, gravel or reclaimed miscellaneous aggregate base, and all equipment, tools, labor and materials incidental thereto.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.44
TOPSOIL**

9.44.03—Construction Methods:

Add the following paragraph to the beginning of the article:

“The Contractor shall notify the Engineer of the location of the topsoil at least 15 calendar days prior to delivery. The topsoil and its source shall be inspected and approved by the Engineer before the material is delivered to the project. Any material delivered to the project, which does not meet specifications or which has become mixed with undue amounts of subsoil during any operation at the source or during placing and spreading, will be rejected and shall be replaced by the Contractor with acceptable material.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.49
FURNISHING, PLANTING and MULCHING
TREES, SHRUBS, VINES and GROUND COVER PLANTS**

9.49.03 – Construction Methods:

Replace subarticle “5. Pits” with the following:

“5. Pits: The pit diameters shall be twice the diameter of the root-spread or container diameters, and shall be 2- inches (50 millimeters) less than the height of the rootball measured from the bottom of the ball to the root collar. (i. e. A 12-inch (300 millimeters) measurement between the root collar and the bottom of the rootball will require a 10-inch (250 millimeters) deep pit). Any excavation in excess of that required shall be replaced with planting soil and compacted to the satisfaction of the Engineer.”

Add the following sentence to subsection “6. Obstructions Below Ground:”

“If removal of obstructions results in a deeper hole than needed for planting, backfill material shall be added and compacted to the satisfaction of the Engineer.”

Replace subarticle “7. Preparation of Backfill” with the following:

“7. Backfill: Backfill shall conform to M.13.01-1 Planting Soil.”

Replace subarticle “8. Setting Plants” with the following:

“8. Setting Plants: All plants shall be plumb and at a level that is 2-inches (50 millimeters) higher than the surrounding ground. Backfill material for all plants shall be thoroughly and properly settled by firming or tamping. Thorough watering shall accompany backfilling. Saucers capable of holding water shall be formed at individual plants (exclusive of plant beds) by placing ridges of planting soil around each, or as directed by the Engineer.

a. Balled and Burlapped plants: Plants shall be handled in such manner so that the soil will not be loosened from the roots inside of the ball. Carefully place the plant into the prepared pits and backfill with planting soil to one - half the depth of the pit, thoroughly tamp to the satisfaction of the Engineer around the ball. Fill the remaining area of the pit with water. Once water has completely drained, loosen the burlap and peel down the top one third. If wire baskets are used, cut and bend down the top third of the basket. Roots that have been wrapped around the ball within the burlap shall be straightened and the remainder of the pit filled with planting soil tamped to ensure that no air pockets remain.

b. Container Grown Plants: Carefully remove the plant from the container over the prepared pits. Gently loosen the soil and straighten all roots as naturally as possible. Place into the bottom of the pit. Backfill with planting soil to one - half the depth of the pit. Thoroughly tamp to the satisfaction of the Engineer. Fill remaining area of the pit with water. Once water has completely drained fill the remainder of the pit with planting soil tamped to ensure that no air pockets remain.

c. Bare-roots Plants: Carefully spread roots as naturally as possible and place into the bottom of the pit. All broken or frayed roots shall be cleanly cut off. Backfill with planting soil to one - half the depth of the pit. Thoroughly tamp to the satisfaction of the Engineer. Fill remaining area of the pit with water. Once water has completely drained fill the remainder of the pit with planting soil tamped to ensure that no air pockets remain.”

Replace subarticle “10. Watering” with the following:

“10. Watering: All plants shall be watered upon setting and as many times thereafter as conditions warrant.

The following is a guide for minimum requirements:

Trees:

2 ½” Caliper and less – Fifteen (15) gallons each.

3” to 5” Caliper – Twenty (20) gallon each.

5 ½” Caliper and above – Twenty-five (25) gallon each.

Shrubs:

24” and less – Six (6) gallon each.

More than 24”- Ten (10) gallon each.

Vines, Perennials, and Ornamental Grasses – Three (3) gallons each.

Groundcovers and Bulbs – Two (2) gallons per square foot.

Water shall be applied at a controlled rate and in such a manner to ensure that the water reaches the root zone (saucer) of the plant or plant bed and does not run off to adjacent areas. Watering shall be applied in a manner that does not dislodge plants, erode soil or mulch, or cause damage to saucer.

The Contractor may use slow-release, drip irrigation bags for watering in accordance with manufacturer’s instructions. The use of these portable/temporary irrigation bags will require the approval of the Engineer.

Overhead hydro-seeder spray nozzles shall not be used as watering devices.”

Replace subarticle “17. Establishment Period” with the following:

“17. One-Year Establishment Period: All plant material shall be subject to a One-Year Establishment Period. During this time, the Contractor shall use currently accepted horticultural practices to keep all plant material installed in a healthy, vigorous growing condition at the date of final acceptance. The date of final acceptance shall be one full

calendar year following the satisfactory completion of the planting activities as confirmed by the Engineer.

An inspection will be held one year from the date of installation with the Contractor, Engineer, and Landscape Designer to determine the acceptability of the plant establishment. An inventory of losses and rejected materials will be made and corrective and necessary clean up measures will be determined at the plant inspection."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.75
MOBILIZATION**

Delete the entire section and replace with the following new section:

**SECTION 9.75
MOBILIZATION AND PROJECT CLOSEOUT**

9.75.01 – Description: This item consists of

1. all work necessary for moving Project personnel and equipment to the Project Site;
2. all work necessary for the establishment of the Contractors' field offices, buildings and other facilities necessary for Contract performance;
3. the preparation of work plans and other documents that must be submitted by the Contractor to the Department prior to the start of physical Project construction. These initial submittals are identified elsewhere in the Contract and may include Project schedules, Project management plans, staging and storage areas, safety plans, quality control plans, erosion and sedimentation control plans, and other documents addressing general Project sequencing or management;
4. demobilization of plant and equipment;
5. completion of all physical work, and
6. completion of administrative closeout items as required by the Contract.

The work entailed in this item shall not be subcontracted in whole or part.

9.75.04 – Method of Measurement: This work will be measured for payment in the manner described hereinafter; however, the total Contract amount earned will not include payments for mobilization that were earned during the period covered by the current monthly estimate, but will include those payments for mobilization that were previously earned and certified for payment.

1. When the first Project payment estimate is reviewed by the Engineer, twenty-five percent (25%) of the lump sum bid price for this item or two and a half percent (2.5%) of the total original Contract price, whichever is less, will be certified for payment as a part of that estimate.
2. When the Contractor's initial Project submittals are accepted by the Engineer, fifty percent (50%) of the lump sum bid price for this item or five percent (5%) of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.
3. When the Contractor's initial Project submittals are accepted by the Engineer, and fifteen percent (15%) of the total original Contract price has been earned by the Contractor, seventy percent (70%) of the lump sum price of this item or seven percent (7%) of the total original Contract price, whichever is less, minus any previous Project payments made to the Contractor for this item, will be certified for payment.
4. When thirty percent (30%) of the total original Contract price has been earned by the Contractor, eighty-five percent (85%) of the lump sum price of this item or eight and a half percent (8.5%) of the total original Contract price, whichever is less, minus any previous payments made to the Contractor for this item, will be certified for payment.

5. When the requirements of Article 1.08.13 have been satisfied by the Contractor, ninety-five percent (95%) of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment.
6. When the requirements of Article 1.08.14 have been satisfied by the Contractor, one hundred percent (100%) of the lump sum price of this item, minus any previous payments made to the Contractor for this item, will be certified for payment. When this payment is made, the Contractor should have received full Contract payment for this item.

Nothing herein shall be construed to limit or preclude the Department from making partial payments to the Contractor that are provided for elsewhere in this Contract.

9.75.05 – Basis of Payment: The work under this item will be paid for at the Contract lump sum price for “Mobilization and Project Closeout,” which price shall include materials, equipment, tools, transportation, labor and all work incidental thereto.

Payment for this item shall be made only once; *i.e.*, for only one instance of mobilization as described in Article 9.75.01 above. If the Contractor mobilizes equipment or facilities more than one time during the course of the Project, due to reasons solely the responsibility of the Department, the additional work entailed therein will be paid for as Extra Work under Section 1.04.05 hereof.

Pay Item	Pay Unit
Mobilization and Project Closeout	l.s. (l.s.)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.77
TRAFFIC CONE**

9.77.02—Materials:

Change the end of the last sentence as follows:

“ Traffic cones used at night shall be reflectorized by utilizing Type VI or Type IX Retroreflective Sheeting, in accordance with Article M.18.09.”

Add the following paragraph after the only paragraph:

“ Prior to using traffic cones on the project, the Contractor shall submit to the Engineer a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of the NCHRP Report 350 or the AASHTO MASH for Category 1 Devices.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.78
TRAFFIC DRUM**

9.78.02—Materials:

Delete the second and third paragraph and replace with the following:

“ Type IX Retroreflective Sheeting, in accordance with Article M.18.09, shall be used on traffic drums. Only one type sheeting shall be used on a drum and all drums furnished on a construction project shall be manufactured with the same type retroreflective sheeting.

Prior to using traffic drums on the project, the Contractor shall submit to the Engineer a copy of the manufacturer’s self-certification that the traffic drums comply with the requirements of the NCHRP Report 350 or the AASHTO MASH for Category 1 Devices.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.79
CONSTRUCTION BARRICADES**

9.79.01—Description:

Delete the only sentence and replace with the following:

“ Under this item the Contractor shall furnish all construction barricades of the specified type required on the Project to comply with the requirements of NCHRP Report 350 (TL-3), or the AASHTO MASH, and the requirements stated in the item "Maintenance and Protection of Traffic," as shown on the plans and as directed by the Engineer.”

9.79.02—Materials:

Delete the last two paragraphs and replace with the following:

“ Alternate stripes of white and orange Type IV or Type IX retroreflective sheeting shall be applied to the horizontal members as shown on the plans. Only one type sheeting shall be used on a barricade and all barricades furnished on a construction project shall have the same type of retroreflective sheeting. Reflective sheeting shall conform to the requirements of Article M.18.09.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by the wind from passing vehicles. Construction barricades shall be approved by the Engineer before they are used.

Materials Certificates shall be required confirming compliance with the requirements set forth in the plans and specifications for these barricades.

Prior to using barricades on the Project, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the barricades comply with the requirements of NCHRP Report 350 (TL-3) or the AASHTO MASH for Category 2 Devices.”

9.79.03—Construction Methods:

Delete the second paragraph in its entirety.

Change the beginning of the only sentence of the third paragraph “Any barricades that are missing, damaged, or defaced so that they are not effective...” to “Ineffective barricades...”

Delete the only sentence in the last paragraph and replace with the following:

“ Barricades that are no longer required shall be removed from the Project and shall remain the property of the Contractor.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.80
CONSTRUCTION STAKING**

Delete the entire Section and replace with the following:

**SECTION 9.80
CONSTRUCTION STAKING**

9.80.01—Description: The work under this item shall consist of construction layout and reference staking necessary for the proper control and satisfactory completion of work on the Project, however establishment of Property lines, highway lines, or non-access lines shall not be deemed work under this item.

This item shall also include all construction layout and reference staking required for identifying construction features within 25 ft (7.625 m) of regulated areas, and for the proper placement of all relocated underground and aerial utilities.

9.80.02—Materials: Stakes used for control staking shall be a minimum of 1 in x 1 in (25 mm x 25 mm) in width and a minimum of 18 in (0.5 m) in length. Stakes shall be legibly marked and shall be visible from the edge of the travelway, and shall be durable enough to last for the duration of the Contract. In areas where traditional staking cannot be established, other materials or methods may be used to mark critical locations, as approved or directed by the Engineer. For slope limits, pavement edges, gutter lines, etc., where so-called "green" or "working" stakes are commonly used, lesser quality stakes will be acceptable, provided that the stakes are suitable for the intended purpose

9.80.03—Construction Methods: The Department will furnish the Contractor such control points, bench marks, and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein.

The Contractor shall be responsible for the placement and preservation of adequate ties to reference points necessary for the accurate re-establishment of base lines, center lines and at all critical locations, including all line-striping and grooving for line-striping, and grades as shown on the plans or directed by the Engineer.

Stakes, references, and batter boards required for construction operations, signing and traffic control shall be furnished, set and properly referenced by the Contractor. The Contractor shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. The Contractor shall call to the Engineer's attention immediately any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions for correction or interpretation prior to proceeding with the affected work.

During roadway construction (or Site work), the Contractor shall provide and maintain for the appropriate periods, as determined by the Engineer, reference stakes at maximum 100-ft (30-m) intervals outside the slope limits. Further, the Contractor shall provide and maintain reference stakes at 50-ft (15-m) intervals immediately prior to and during the formation of subgrade and the construction of subsequent pavement layers.

These stakes shall be properly marked as to station and offset, and shall be referenced to the proposed grade.

Wetland Areas: When identified in the Contract, the Contractor shall provide additional reference stakes to assist the Engineer and regulatory personnel in the duties at regulated areas, including inland wetlands, tidal wetlands and watercourses. The Contractor shall place additional reference stakes to identify all slope limits, culvert ends, endwalls, riprap areas and other construction features within 25 ft (7.625 m) of regulated areas. For the placement of these additional stakes the regulated areas, approximate slope limits and other construction features are those shown on the environmental permit plates included in the Contract, or the latest revisions available. The Contractor shall provide stakes at a maximum spacing of 50 ft (15 m). Each stake shall be marked in a manner acceptable to the Engineer, to identify the baseline station and offset, and the feature it represents. The Contractor shall maintain or replace these stakes until the Engineer approves their removal.

Utility Relocations: The Contractor shall provide additional reference stakes to assist the Engineer and public utility personnel to accurately identify the proposed locations for utility facilities to be relocated. At least two weeks prior to the scheduled relocation of public utilities, the Contractor shall stake out the following features throughout the limits of utility relocations:

1. The proposed edge of road on the side adjacent to the proposed utility relocations.
2. Both edges of proposed sidewalks, where shown on the plans.

The Contractor shall provide stakes at a maximum spacing of 25 ft (7.625 m), unless directed otherwise by the Engineer.

The Contractor shall provide and maintain reference stakes at structures such as drainage structures, and shall include additional reference stakes for the determination of the structure alignments as may be needed for the proper construction of the drainage or other structure. The reference stakes shall be placed immediately prior to, and maintained during, the installation of the drainage structure. These stakes shall be properly marked as to station and offset, and shall be referenced to the proposed grade.

The Contractor shall furnish to the Engineer copies of any data used in setting and referencing stakes and other layout markings used by the Contractor after completion of each related operation, if requested to do so by the Engineer.

The Contractor shall provide safe facilities for convenient access by Department forces to all survey stakes, control points, batter boards, and references when requested to do so by the Engineer.

All staking shall be performed by qualified engineering or surveying personnel trained, experienced and skilled in construction layout and staking of the type required under the Contract. Prior to the start of related work, the Contractor shall submit to the Engineer for review and comment the qualifications of personnel responsible for construction staking on the Project. The submission shall include a description of the experience and training that the proposed personnel possesses and a list of State projects that the personnel have worked on previously. On all bridge projects, surveying shall be performed under the direct supervision of a Professional Surveyor licensed in the State of Connecticut. All field layout and staking required for the Project shall be performed under the direct supervision of a person, or persons, with engineering background, experienced in the direction of such work and acceptable to the Engineer. If the personnel responsible for construction staking should change during the course of the

Project, a revised submittal will be required prior to the Contractor's being allowed access to the Site.

The Department may check the control of the work, as established by the Contractor, at any time. The Contractor will be informed of the results of these checks, but the Department, by so doing, in no way relieves the Contractor of responsibility for the accuracy of the layout work. The Contractor shall correct or replace, at the Contractor's own expense, any deficient layout and construction work that may result from inaccuracies in the Contractor's staking operations from its failure to report such inaccuracies found in work done by the Department or by others. If, as a result of such inaccuracies, the Department is required to make further studies, redesign, or both, the Department will deduct all expenses incurred by the Department in doing so from any monies it owes to the Contractor.

The Contractor shall furnish all necessary personnel, surveying instruments, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of work under this item.

For roadways where the existing pavement markings need to be reestablished or grooved markings are to be used: Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer must establish and document pavement marking control points from the existing markings. These control points shall be used to reestablish the positions of the lanes, the beginnings and endings of tapers, channelization lines for on- and off-ramps, lane-use arrows, stop bars, driveways, private drives, road entrances, and any lane transitions in the Project area, including all line striping grooving. The Contractor shall use these control points to provide appropriate premarking prior to the installation of final markings, including grooves.

The Contractor shall provide and maintain reference stakes or markings at 100-ft (30-m) intervals immediately off the edge of pavement, so that the Contractor will later be able to reestablish the existing pavement markings and necessary line stripe grooving limits. The Contractor shall also provide and maintain additional reference stakes and/or markings at any point where there is a change in pavement markings, so that the Contractor will later be able to reestablish the existing pavement markings and grooving limits.

For non-limited access roadways: On non-limited access roadways the Contractor may need to adjust the final locations of the pavement marking or grooving limits in light of a need to accommodate pedestrian and bicycle traffic. Prior to any resurfacing or obliteration of existing pavement markings, the Contractor, the Engineer, and a representative from the Division of Traffic Engineering must establish and document pavement marking control points from the existing marking and grooving limits as described above. The control points at that time may be adjusted to provide wider shoulders while maintaining through travel lane widths of no less than 11 ft (3.3 m). Suggested lane/shoulder widths for commonly encountered half sections are shown in the table below.

Centerline to curb or edge of road	Lane width	Shoulder width
12 to 16 ft (3.6 to 4.9 m)	11 ft (3.3 m)	Remaining Pavement
17 to 20 ft (5.2 to 6.1 m)	12 ft (3.6 m)	Remaining Pavement

9.80.04—Method of Measurement: Construction staking will be measured for payment as a Contract lump sum item.

9.80.05—Basis of Payment: Construction staking will be paid for at the Contract lump sum price for "Construction Staking," which price shall include all maintenance, materials, tools, equipment, labor and work incidental thereto, including removal of materials. The Contractor shall submit to the Department a schedule of payment values for review and comment prior to payment.

Pay Item	Pay Unit
Construction Staking	l.s. (l.s.)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 9.81
42 INCH (1 METER) TRAFFIC CONE**

9.81.01—Description:

Delete the only sentence and replace with the following:

“ This item shall consist of furnishing 42-inch (1.07-meter) retroflective traffic cones required on the Project to meet the requirements of the traffic control plans, as stated in the item "Maintenance and Protection of Traffic," as shown on the plans or as directed by the Engineer.”

9.81.02—Materials:

Delete the last two paragraphs and replace with the following:

“ Retroflective stripes shall be fabricated from Type IX retroflective sheeting. All stripes shall be of one type of sheeting. Retroflective sheeting shall conform to Article M.18.09. Prior to using traffic cones on the Project, the Contractor shall submit to the Engineer a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of NCHRP Report 350 or the AASHTO MASH for Category 1 Devices.”

9.81.03-Construction Methods:

In the first sentence, change “manufacturers” to “manufacturer’s.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 10.00
GENERAL CLAUSES FOR HIGHWAY
ILLUMINATION AND TRAFFIC SIGNAL
PROJECTS**

Add the following new article after 10.00.13 Service Installations:

“ 10.00.14- Maintenance of Illumination During Construction: The Contractor shall organize the Project work so that any portion of roadway which has existing roadway illumination and is open for use remains lighted. The Contractor shall also provide illumination on all temporary crossovers, ramps and roadways that are constructed as part of staged construction and that are open for use. Highway illumination may consist of: existing lighting, new lighting, temporary lighting, or any combination thereof. It is the Contractor's responsibility to stage the installation or relocation of service cabinets, poles, lights, and circuitry so that all roadways of the kind described above remain lighted. If it is necessary to install temporary poles, lights, or circuitry to maintain the integrity of the highway illumination system, such work shall be submitted to the Engineer for approval prior to installation, and will be paid for at the Contract bid unit price for the relevant items. Temporary illumination work not specifically covered by the Contract specifications and pay items will be paid for as extra work at the discretion of the Engineer.

If the Contract includes temporary illumination plans, those plans shall serve as a framework for providing roadway illumination during construction. Temporary illumination plans may not represent the full extent of the temporary illumination work required, or the exact quantity of temporary lights required to maintain proper roadway illumination.

Prior to the start of any work that will interfere with the existing lighting system, the Contractor and ConnDOT District Electrical Maintenance personnel shall inspect the system for lighting outages, pole knockdowns, and circuit malfunctions. Deficiencies will be noted and repaired by Department forces prior to the start of work by the Contractor.

Once the Contractor's work interferes with or impacts the existing roadway lighting system, maintenance of that system within the Project limits becomes the Contractor's responsibility. The repair of lighting system malfunctions occurring outside of the project limits, caused by the Contractor's work, shall also be the Contractor's responsibility. District Construction personnel will note the start and end date of the Contractor's responsibility for maintenance of any existing lighting system.

The Contractor shall maintain the illumination throughout the duration of the Project, until the Project is accepted by the State. The Contractor shall supply to the Project Engineer and to the ConnDOT District Electrical Maintenance Supervisor, the names and phone numbers of a primary and back-up representative, to be contacted should a problem with the lighting system occur.

Whoever discovers a lighting outage or pole damage/knockdown within the Project limits shall immediately notify ConnDOT Highway Operations of same as follows:

1. For projects in Districts 1, 2, and 4, call (860) 594-3447.
2. For projects in District 3 and along the Interstate 95 corridor within District 2, call (203) 696-2690.

The following procedures will be followed for lighting outages:

- 1) Once notified of a lighting outage, ConnDOT Electrical Maintenance personnel will assess the situation, and in the case of a pole knockdown, may clear the pole from the roadway and make safe any exposed wires.
- 2) The Project Inspector and the Contractor's designated representative shall be notified after the lighting outage has been assessed by ConnDOT Electrical Maintenance, transferring responsibility for further repairs to the Contractor.
- 3) Upon notification, the Contractor shall be responsible to repair the lighting system before the normal nighttime turn-on of the lights. If this cannot be achieved, the Contractor shall make the lighting operational prior to the next normal nighttime turn-on of the lights, up to a maximum of 24 hours from the time the Contractor was notified of the problem. The Contractor shall contact the Project Inspector to discuss the situation, the steps to be taken to bring the lighting back on line, and the time frame for doing so.
- 4) For isolated individual luminaire outages (not a continuous circuit), the Contractor shall repair such luminaires within 48 hours from the time that the Contractor became aware of the outage.

The Contractor shall follow standard "lock-out," "tag-out," and "Call Before You Dig" procedures when working on the lighting circuit. Both the Contractor and ConnDOT Electrical Maintenance shall have mutual access to active lighting control cabinets.

The Contractor will be reimbursed for any costs associated with the maintenance of the existing lighting system that are beyond the Contractor's control. Reimbursements will be for damage caused by the general public and normal system age related component failures (such as lamp burn-out, ballast/starter failure or cable splice failure). However, the Contractor shall be responsible for repair of damage to the existing lighting system incurred as the result of their operations including damage caused by improper wiring methods. All repairs or replacements due to the Contractor's operations shall be made by the Contractor at their expense.

The Project Inspector will maintain a log book of any lighting repair work performed, which will include a description of the repairs, and the date the work was performed. The log book will be made accessible to ConnDOT Electrical Maintenance personnel.

Temporary illumination circuitry shall consist of pre-assembled aerial cable of the type and size as indicated in the Contract documents or as directed by the Engineer.

The Contractor shall notify the Engineer when aerial cable cannot be installed due to construction activities and shall suggest another method for installation of the cable.

Alternate options may include installing cable in duct underground, or installing surface-mounted cable in duct or PVC conduit with cable along the backside of a bridge parapet or temporary concrete barrier curbing. Temporary cable in duct/conduit or aerial cable lying directly on the ground will not be allowed. The option of surface-mounting duct or conduit to the backside of a parapet or barrier will be allowed only when construction activities make it necessary, and where the surface-mounted conduit will not expose workers to a high voltage hazard. The Contractor must obtain the Engineer's approval to do so prior to installing temporary circuitry not installed overhead, unless otherwise indicated on the plans.

When temporary circuitry is installed in trench, standard warning tape procedures shall be followed as set forth in Article 1.05.15. When temporary circuitry is surface mounted to the backside of a parapet or barrier wall, the Contractor shall install warning placards which read: "Live Electricity." Warning placards shall be installed at the beginning, end, and at intermittent points 100 feet (30 meters) apart along the exposed length of the duct/conduit. All temporary lighting circuits shall include a continuous No. 8 bare copper grounding conductor connected to all light standards and effectively grounded as per the NEC."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 10.01
TRENCHING AND BACKFILLING**

10.01.01- Description:

In the only sentence of the first paragraph after "...satisfactory..." add the following: "clean-up and".

In the only sentence of the second paragraph after "...reconstruction of..." add the following: "bituminous, concrete and granite curbing,".

10.01.05- Basis of Payment:

In the only sentence of the second paragraph after "...mulching..." add the following: "clean-up and". After "...installing..." add the word "curbing,".

At the end of the third paragraph, add the following: "In the absence of a "Rock in Trench Excavation" item, the work will be compensated as extra work."

In the only sentence of the sixth paragraph, after "...unit price for 'Concrete Sidewalk'..." add the following: "or as extra work, if no unit price has been established."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 10.10
CONCRETE HANDHOLE**

10.10.02 – Materials:

Replace “M.03.01” with “M.03” for both Class A and Class C Concrete.

10.10.05 – Basis of Payment

In the first sentence, remove the words “ground wire”.

At the end of the paragraph add the following sentence:

“The ground wire (bonding wire) is included in the Contract unit price under Section 10.08 – Electrical Conduit.”

Add the word “Cover” to the end of the pay item “Cast Iron Handhole”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 11.13
CONTROL CABLE**

11.13.03 – Construction Methods:

In the 1st paragraph of subsection 2 replace “MIL” with “MILSPEC.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 12.07
SIGN FACE – EXTRUDED ALUMINUM**

Change the Section title from “Sign Face – Extruded Aluminum (Type III Reflective Sheeting)” to “Sign Face – Extruded Aluminum.”

12.07.03—Construction Methods:

After the last paragraph, add the following:

“ All overhead sign foundations shall be field staked. The locations of the stakes shall be accepted by an Engineer from the Division of Traffic Engineering, a minimum of seven (7) days prior to installation.

For all side mounted signs, the edge of the sign closest to the roadway and the sign foundation shall be field staked and accepted by an Engineer from the Division of Traffic Engineering, a minimum of seven (7) days prior to installation.

For side-mounted signs, the offset to the near edge of the sign face shall exceed the maximum deflection of the guide rail, unless otherwise shown on the plans or directed by the Engineer.”

12.07.05—Basis of Payment:

In the Pay Item – Pay Unit table, delete “(Type IV Reflective Sheeting).”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 12.08
SIGN FACE – SHEET ALUMINUM**

12.08.01—Description:

Delete the only paragraph and replace with the following:

“ This item shall consist of furnishing and installing sign face-sheet aluminum signs of the type specified, metal sign posts, span-mounted sign brackets and mast arm-mounted sign brackets at locations indicated on the plans or as ordered and complying with the requirements of the plans and these Specifications.”

12.08.02—Materials:

Delete the entire article and replace with the following:

“ Reflective sheeting shall meet the requirements of Article M.18.09, Type IV or IX. Sheet aluminum sign blanks shall meet the requirements of Article M.18.13. Silk screening of Type IV or IX reflective sheeting shall meet the requirements specified by the reflective sheeting manufacturer. Metal sign posts shall meet the requirements of Article M.18.14. Sign mounting bolts shall meet the requirements of Article M.18.15.”

12.08.03—Construction Methods:

In the first sentence of the first paragraph, change “... shall conform to ...” to “...shall be as shown in ...”

In the third and fourth sentences of the first paragraph, change “Type III” to “Type IV or IX.”

In the first sentence of the third paragraph, change “Type I, Type II or Type III” to “Type IV or IX.”

In the last sentence of the third paragraph, change “Type I or Type II” to “Type IV or IX.”

Delete the last sentence of the last paragraph.

12.08.05—Basis of Payment:

In the only paragraph, delete “... or parapet mounted sign support ...”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 12.10
EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS**

12.10.03—Construction Methods:

2. Procedures:

Insert the following after the sixth paragraph:

“The epoxy shall be uniformly applied to the surface to be marked to ensure a wet film thickness of the applied epoxy, without glass beads, of 20 mils +/- 1 mil (500 um +/- 25 um).”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 12.20
CONSTRUCTION SIGNS—
TYPE III REFLECTIVE SHEETING**

Delete the entire Section, including "Type III Reflective Sheeting" in the title, and replace it with the following:

**SECTION 12.20
CONSTRUCTION SIGNS**

12.20.01—Description: Under this item the Contractor shall furnish, install and remove construction signs with reflective sheeting and their required portable supports or metal sign posts that comply with the requirements of NCHRP Report 350 (TL-3) or MASH for Category 2 Devices. The construction signs and their required portable supports or metal sign posts shall comply with the signing requirements stated in the item "Maintenance and Protection of Traffic," as shown on the plans and/or as directed by the Engineer. The Contractor shall furnish a sufficient number of signs to provide the signing patterns for all operations which are being undertaken concurrently.

12.20.02—Materials: Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) comply with the requirements of NCHRP Report 350 (TL-3) or MASH for Category 2 Devices.

All sign faces shall be rigid and reflectorized and shall meet the requirements of Article M.18.09. If used as rigid substrate, sheet aluminum sign blanks shall comply with the requirements of Article M.18.13. Metal sign posts shall comply with the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall comply with the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs.

12.20.03—Construction Methods: The signs and their portable supports or metal posts shall comply with the requirements as shown on the plans and the latest edition of the "Manual on Uniformed Traffic Control Devices." Drawings of the signs, showing placement and dimensions of legend and border, are available for inspection at the Division of Traffic, Connecticut Department of Transportation.

Various types of portable sign supports may be used. These portable supports shall be fabricated in such a manner as to minimize the possibility of the signs being blown over or displaced by the wind from passing vehicles and are to be of a yielding type to withstand impact with minimal damage to the signs, supports, or vehicles. Portable sign supports shall be approved by the Engineer before they are utilized on the Project. Mounting height of signs on portable sign supports shall be a minimum of 1 ft (0.3 m)

and a maximum of 2 ft (0.6 m), measured from the pavement to the bottom of the sign.

Signs in other than good condition shall be replaced with acceptable signs as determined by the Engineer.

Suitable attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board types substrates, foam core and composite aluminum sign substrates.

Field Performance: Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of three (3) years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2 degree observation angle and -4 degree entrance angle. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

Signs and their portable sign supports or metal posts that are no longer required shall be removed from the Project and shall remain the property of the Contractor.

12.20.04—Method of Measurement: The work to furnish, install and remove construction signs will be measured for payment by the number of square feet (square meters) of sign face delivered and used on the Project. Sign supports will not be measured for payment.

12.20.05—Basis of Payment: This item will be paid for at the Contract unit price per square foot (square meter) for "Construction Signs," delivered and used on the Project, which price shall include the signs, portable sign supports, metal sign posts and all hardware required to attach the sign to the support or posts. Each sign and support or posts furnished will be paid for once, regardless of the number of times used on the Project.

Pay Item	Pay Unit
Construction Signs	s.f. (s.m)

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 18.00
GENERAL CLAUSES -
IMPACT ATTENUATION SYSTEMS**

18.00.01—Description:

Change the end of the first sentence "... with the Specifications and in conformity with the Plans or as directed by the Engineer." to "... with the plans and Specifications or as directed by the Engineer."

18.00.02—Performance Criteria:

Delete the entire article and replace it with the following:

" These devices shall have approval in writing from FHWA documenting that they comply with the requirements of the NCHRP Report 350 or the AASHTO MASH for Category 3 Devices."

18.00.05—Delineation of Impact Attenuation Systems:

Delete the entire article and replace it with the following:

" All impact attenuation systems shall have an attenuator reflector attached to the front of the system, as shown on the plans."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION 18.06
TYPE D PORTABLE IMPACT ATTENUATION SYSTEM**

18.06.02—Materials:

Delete the first two paragraphs and replace with the following:

“ Prior to using a new TMA, the Contractor shall submit to the Engineer a materials certificate in accordance with Article 1.06.07 for each system supplied and a copy of the FHWA Letter of Acceptance issued to the manufacturer documenting that the device complies with the requirements of the NCHRP Report 350 (TL-3) or the AASHTO MASH for Category 3 Devices.

If the system is not furnished new, the Contractor shall document and demonstrate to the Engineer's satisfaction that the system complies with the requirements of a new system, NCHRP Report 350 (TL-2), or the AASHTO MASH and may be used until the end of the attenuation device's useful service life.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.03
PORTLAND CEMENT CONCRETE**

Delete the entire Section and replace it with the following:

**SECTION M.03
PORTLAND CEMENT CONCRETE**

- M.03.01 - Component Materials**
- M.03.02 - Mix Design Requirements**
- M.03.03 - Producer Equipment and Production Requirements**
- M.03.04 - Curing Materials**
- M.03.05 - Non Shrink, Non Staining Grout**
- M.03.06 - Expansive Cement for Anchoring**
- M.03.07 - Chemical Anchors**
- M.03.08 - Joint Materials**
- M.03.09 - Protective Compound/Sealers**
- M.03.10 - Formwork**

M.03.01 – Component Materials

1. Coarse Aggregate: Coarse aggregate shall be broken stone, gravel, or reclaimed concrete aggregate defined as mortar-coated rock, consisting of clean durable fragments of uniform quality throughout. It shall be free from soft, disintegrated pieces, mud, dirt, organic or other injurious material and shall not contain more than 1 percent of dust by mass, as determined by AASHTO T-11. Coarse aggregate of a size retained on a 1-inch (25 mm) square opening sieve shall not contain more than 8% of flat or elongated pieces, whose longest dimension exceeds 5 times their maximum thickness. Heating or cooling of coarse aggregates may be required to meet concrete mix temperature requirements at time of placement.

- (a) Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO Method T 104, coarse aggregate shall not have a loss of more than 10% at the end of 5 cycles.
- (b) Loss on Abrasion:** When tested by means of the Los Angeles Machine, using AASHTO Method T 96, coarse aggregate shall not have a loss of more than 40%.
- (c) Gradation:** Grading and stone sizes of the coarse aggregate shall conform to Article M.01.01 as determined by AASHTO T-27. All coarse aggregate proportions shall be approved in advance by the Transportation Division Chief (TDC) as part of the Mix Design requirements.
- (d) Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.

- (e) **Reclaimed Concrete Aggregate:** In addition to the above requirements (a-d), when reclaimed concrete aggregate is proposed, it shall be tested for chloride in AASHTO T-260 "Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials." Aggregate shall not be used if the chloride content as determined from this test exceeds 0.5 pound/cubic yard (297 g/cubic meter). Regardless of chloride content, reclaimed concrete aggregate shall not be used in concrete mixes used for pre-stressed concrete construction.

2. Fine Aggregate: Fine aggregate shall be natural or manufactured sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, mica, loam, organic or other injurious material. In no case shall fine aggregate containing lumps of frozen material be used. Heating or cooling of fine aggregates may be required to meet concrete mix temperature requirements at time of placement.

For continued shipments of fine aggregate from a given source, the fineness modulus of any sample shall not vary more than 0.20 from the base fineness modulus. The base fineness modulus for a source shall be established by the Engineer and may be revised based on current testing results.

- (a) **Fine Material:** Fine aggregate shall contain not more than 3% of material finer than a #200 sieve (75µm), as determined by AASHTO T 11.
- (b) **Organic Impurities:** Fine aggregate subjected to the colorimetric test shall not produce a color darker than Gardner Color Standard No. 11, using AASHTO T 21. If the fine aggregate fails to meet this requirement, the provisions of AASHTO M 6, Section 7.2.3, may apply.
- (c) **Gradation:** Fine aggregate gradation shall be within the ranges listed in Table M.03.01-1 for any source. All fine aggregate proportions shall be approved in advance by the TDC as part of the Mix Design requirements.
- (d) **Soundness:** When tested with magnesium sulfate solution for soundness, using AASHTO T 104, fine aggregate shall not have a loss of more than 10% at the end of 5 cycles. Fine aggregate that fails to meet this requirement, but meets all other requirements, may be allowed for use on a restricted basis with the approval of the Engineer on a case-by-case basis. Typically concrete forming any surface subject to polishing or erosion from running water will not be allowed to contain such material.
- (e) **Storage:** Aggregate stockpiles shall be located on smooth, hard, sloped/well-drained areas. Each source and gradation shall have an individual stockpile or bin. Aggregates shall be handled from stockpiles or other sources to the batching plant in such manner as to minimize segregation of the material. Aggregates that have become segregated, or mixed with earth or foreign material, shall not be used.

Table M.03.01-1 TOTAL % PASSING BY WEIGHT

Sieve Size	3/8" (9.5mm)	No. 4 (4.75mm)	No. 8 (2.36mm)	No. 16 (1.18mm)	No. 30 (600µm)	No. 50 (300µm)	No. 100 (150µm)
Percent Passing	100	95-100	80-100	50-85	25-60	10-30	2-10

3. Cement:

- (a) **Portland:** Types I, II, and III Portland cement shall conform to the requirements of AASHTO M 85. Type I and Type III Portland cement shall be used only when required or expressly permitted by the Project specification or the Engineer. The use of Type I or III will require that these mixtures be submitted as Non-standard Mix Designs. All cement shall be provided by a mill participating in the Departments' Cement Certification program. The requirements of the Certification Program are detailed in the Department's Quality Assurance Program for Materials.
- (b) **Pre-Blended Cements:** Binary or Ternary cements consisting of Portland Cement and supplemental cementitious materials may be used provided that all the requirements of Subarticles M.03.01- 3(a) and -3(c) are met.

- (c) Replacement Materials:** Unless already approved as a Standard Mix Design, any Contractor proposed Mix Designs with partial replacement of Portland Cement (PC) with fly ash or ground granulated blast furnace slag (GGBFS), shall be submitted in writing to the Engineer for approval prior to the start of work, on a project-by-project basis. The type of material, source, and the percentage of the PC replaced shall be clearly indicated. Upon request, a Certified Test Report for the cement replacement material shall be provided to the Engineer for use during the Mix Design review.
1. Fly Ash: Fly ash to be used as a partial replacement for Portland cement shall meet the requirements of AASHTO M 295, either Class C or Class F, including the uniformity requirements of Table 2A. Loss on Ignition for either class of fly ash shall not exceed 4.0%. Fly ash may be used to replace up to a maximum of 20% of the required Portland cement. The fly ash shall be substituted on a weight (mass) basis, with a minimum of 1 pound (45 kg) of fly ash for 1 pound (45 kg) of Portland cement. Different classes of fly ash or the same class from different sources shall not be permitted on any single project without the written approval of the Engineer.
 2. Ground Granulated Blast Furnace Slag (GGBFS): GGBFS used as a partial replacement for Portland cement shall conform to the requirements of AASHTO M 302/ASTM C989, Grade 100 or 120. As determined by the Engineer, GGBFS may be used to replace a maximum of 30% of the required Portland cement. The Engineer may restrict or prohibit the use of GGBFS if ambient temperatures anticipated during the placement and initial curing of the concrete are low. The GGBFS shall be substituted on a weight (mass) basis, with a minimum of 1 pound (45 kg) of slag for 1 pound (45 kg) of Portland cement. Different sources of GGBFS shall not be permitted on any single project without the written approval of the Engineer.
- 4. Water:** All water used in the mixing of concrete shall be clear in appearance and free from oil, salt, acids, alkalis, sugar, and organic matter. Surface water may be used if not taken from shallow or muddy sources; classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping; and accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer. The Engineer may request that water from any surface or ground source be tested in accordance with AASHTO T26 and AASHTO D512 if the appearance or scent of the water is suspect. To be acceptable, the pH of the water must not be less than 6.0 or greater than 8.0 and Chloride Ion Concentration of the water must not exceed 250ppm (250 mg/L). Potable water taken directly from a municipal or regional water supply may be used for mixing concrete without testing. Heating or cooling of water may be required to meet mix temperature requirements at time of placement.
- 5. Admixtures:** All admixtures shall perform their function without injurious effects upon the concrete. If requested by the TDC, the Contractor shall present a certified statement from a recognized laboratory attesting to this requirement. A "recognized" laboratory is any cement and concrete laboratory approved and inspected regularly by the Cement and Concrete Reference Laboratory (CCRL). The statement shall contain results of compression tests of cylinder specimens made with concrete utilizing the admixture(s) in proportions equal to those proposed by the Contractor. The results of at least 5 standard 6-inch x 12-inch (150 mm x 300 mm) cylinders of each mix design shall be listed with the results of at least 5 like-sized cylinders not utilizing the admixture(s). Specimens must be made and cured in the laboratory in accordance with AASHTO T 126 and will be tested in accordance with AASHTO T 22.
- (a) Air-Entraining Admixtures:** In the event that air entrained concrete is required, an admixture conforming to the requirements of AASHTO M 154 may be used. Tests for 7 and 28-day compressive and flexural strengths and resistance to freezing and thawing are required, but tests for bleeding, bond strength and volume change will not be required.

- (b) Other Chemical Admixtures:** In the event that concrete properties are specified that require the use of additional admixtures, or the Contractor proposes the use of additional admixtures to facilitate placement, the admixtures shall conform to the requirements of AASHTO M194M/M, including the 1 year performance data.

M.03.02 – Mix Design Requirements

1. Standard ConnDOT Mix Designs: Standard Mix Designs shall be designed in accordance with applicable sections of ACI 211 and ACI 318. The mixtures shall consist of Portland cement, fine aggregate, coarse aggregate, admixtures¹, and water proportioned in accordance with Table M.03.02-1. The mixtures shall also be designed to obtain the physical properties of plastic concrete as specified in Article 6.01.03.

Table M.03.02-1

TYPE	28-day Minimum Compressive Strength psi (megapascals)	Water / Cement; or Water / Cement plus other approved Cementitious Material, by weight (mass), Maximum	Minimum Cement ² Required lbs/cy (kg/cm)	Maximum Aggregate Size Required Section M.01.01
Class "A"	3300 (23)	0.53	615 (365)	No. 4
Class "C"	3300 (23)	0.53	658 (390)	No. 6
Class "F"	4400 (30)	0.44	658 (390)	No. 6
Pavement	3500 (24)	0.49	615 (365)	No. 4
Slope Paving	2200 (15)	0.69	455 (270)	No. 3
¹ Approved admixtures may be used in proportions recommended by the manufacturer.				
² Portland Cement may be partially replaced within a Standard Mix Design by other approved cementitious material meeting the requirements of Article M.03.01-3(b) if permitted by the Engineer.				

Mix designs shall indicate the dosage of admixtures anticipated to provide plastic properties required in the Project specification. Properties of standard classes of concrete in the plastic state are listed in Article 6.01.03

Standard Mix Designs are required to be designed and submitted by the concrete producers, and are approved by the Department on a standing basis. Submittal or re-approval of these Standard Mix Designs on an annual basis is not required. Previously approved producer-designed Standard Mixes that have a record of satisfactory performance may be utilized on Department projects unless there is a change in the gravimetric properties or the sources of any materials. Revisions to the Standard Mix Designs, which include changes in component sources, can be submitted at any time to the TDC, but must be approved prior to use on Department projects.

2. Non-Standard ConnDOT Mix Designs: Any proposed Mix Designs that do not comply with Table M.03.02-1 are required to be submitted 15 days prior to use on a project-by-project basis and be approved by the TDC prior to use. The use of an approved admixture with an otherwise approved Standard Mix Design is not considered non-standard.

All Non-standard Mix Designs used for load-bearing structures shall contain a minimum of 658 lbs/cubic yard (390 kg/cubic meter) of cementitious materials.

Concrete used in applications such as flowable fill or controlled low-strength material may be designed with less than 658 lbs/cubic yard (390 kg/cubic meter) of cementitious materials.

M.03.03 - Producer Equipment and Production Requirements

1. General Requirements: The source of the concrete must be approved by the Engineer prior to use on Department projects. Specifically the location and capacity of the central mix or dry batch plant, and complement of truck mixers/haulers, shall be adequate for continuous placement of concrete on a typical Department project. Approval may be revoked at any time in accordance with Section 1.06.01.

- (a) Inspection:** The production facility supplying hydraulic cement concrete shall have a current Certification of Ready Mixed Concrete Production Facilities from the National Ready Mixed Concrete Association (NRMCA), or equivalent certification approved by the Engineer.
 - (b)** In addition to the requirements of approved third party certification, the facility shall produce batch tickets that conform to Subarticle 6.01.03-3(a).
 - (c) Quality Control:** The Contractor is responsible for all aspects of Quality Control (QC). As determined by the Engineer, should material delivered to a project not meet specification, the Contractor may be required to submit to the Engineer a corrective procedure for approval within 3 calendar days. The procedure shall address any minor adjustments or corrections made to the equipment or procedures at the facility.
 - (d) Suspension:** As determined by the Engineer, repeated or frequent delivery of deficient material to a Department project may be grounds for suspension of that source of material. A detailed QC plan that describes all QC policies and procedures for that facility may be required to formally address quality issues. This plan must be approved by the Engineer and fully implemented, prior to reinstatement of that facility.
- 2. Hand Mixed Concrete:** Hand mixing shall be permitted only with the permission of the Engineer. Hand mixed batches shall not exceed 1/2 cubic yard (0.5 cubic meter) in volume. Hand mixing will not be permitted for concrete to be placed under water.

M.03.04 - Curing Materials

1. Water: Any water source deemed acceptable by the Engineer for mixing concrete may be used to provide water for curing purposes. Surface water may be used if classified as Class C or Class D on the Department of Energy and Environmental Protection (DEEP) Water Quality Classification mapping and accommodations have been made to prevent contaminants from entering the supply to the satisfaction of the Engineer.

In general, water shall not be taken from shallow or muddy sources. In cases where sources of supply are relatively shallow, the intake pipe shall be enclosed to exclude silt, mud, grass, etc.; and the water in the enclosure shall be maintained at a depth of not less than 2 feet (610 mm) under the intake pipe.

2. Mats: Mats for curing concrete shall be capable of maintaining moisture uniformly on the surface of the concrete. The mats shall not contain any materials such as dyes, sugar, etc., that may be injurious to the concrete.

The length or width of the mats shall be sufficient to cover all concrete surfaces being cured. Should more than one mat be required, sufficient overlap shall be provided by the Contractor as determined by the Engineer.

3. Liquid Membrane-Forming Compound: Liquid membrane-forming compound shall conform to the requirements of AASHTO M 148 Type 2, Class B, or shall be a water-soluble linseed oil-based compound conforming to the requirements of AASHTO M 148, Type 2.

4. White Polyethylene Sheeting (Film): White polyethylene sheeting (film) shall conform to the requirements of AASHTO M 171.

M.03.05 - Non Shrink, Non Staining Grout

1. Bagged (pre-mixed): Bagged (pre-mixed) formulations of non-shrink grout shall meet the requirements of ASTM C 1107. The grout shall be mixed with potable water for use. The grout shall be mixed to a flowable consistency as determined by ASTM C 230. All bagged material shall be clearly marked with the manufacturer's name, date of production, batch number, and written instructions for proper mixing, placement and curing of the product.

2. Bulk: The Contractor may formulate and design a grout mix for use on the Project in lieu of using a pre-bagged product. The Contractor shall obtain prior written approval of the Engineer for any such proposed Mix Design. Any such Mix Design shall include the proportions of hydraulic cement, potable water, fine aggregates, expansive agent, and any other necessary additive or admixture. This material shall meet all of the same chemical and physical requirements as shall the pre-bagged grout, in accordance with ASTM C 1107.

M.03.06 – Expansive Cement for Anchoring

The premixed anchoring cement shall be non-metallic, concrete gray in color and prepackaged. The mix shall consist of hydraulic cement, fine aggregate, expansive admixtures and water conforming to the following requirements:

1. The anchoring cement shall have a minimum 24 hour compressive strength of 2,600 psi (18 megapascals) when tested in accordance with ASTM C 109.
2. The water content of the anchoring cement shall be as recommended by the manufacturer. Water shall conform to the requirements of Subarticle M.03.01-4.

The Contractor shall provide a Certified Test Report and Materials Certificate for the premixed anchoring cement in conformance with Article 1.06.07. The Contractor shall also provide, when requested by the Engineer, samples of the premixed anchoring cement for testing and approval.

M.03.07 – Chemical Anchors

Chemical anchor material must be listed on the Departments' Qualified Products List and approved by the Engineer for the specified use.

The chemical anchor material shall be epoxy or polyester polymer resin. It shall not contain any metals or other products that promote corrosion of steel. The Contractor shall supply the Engineer with a Certified Test Report and Materials Certificate for the chemical anchor material in conformance with Article 1.06.07. When requested by the Engineer, the Contractor shall also provide samples of the chemical anchor material.

M.03.08 – Joint Materials

- 1. Transverse Joints for Concrete Pavement:** Transverse joints shall consist of corrosion resistant load transfer devices, poured joint seal and in addition, in the case of expansion joints, expansion joint filler all conforming to the following requirements:
 - (a) The corrosion resistant load transfer device shall be coated steel or sleeved steel or be made of corrosion resistant material. The dimensions of any devices used shall be as shown on the plans, exclusive of any coating or sleeving. Core material of coated or sleeved metallic devices shall be steel meeting the requirements of AASHTO M 255M/M 255 Grade 520, or steel having equal or better properties and approved by the Engineer. Nonmetallic devices shall meet the various strength requirements applicable to metallic devices as well as all other requirements stated herein.
 - (b) All coated load transfer devices shall conform to the requirements of AASHTO M 254. Uncoated or sleeved load transfer devices shall meet the applicable physical requirements of AASHTO M 254. The use of field applied bond breakers will not be permitted.

- (c) The basis of acceptance for corrosion resistant load transfer devices shall be the submission by the Contractor of a minimum of 2 samples accompanied by Certified Test Reports conforming to the requirements of Article 1.06.07 demonstrating that the load transfer device conforms to the requirements of AASHTO M 254 for the type of device supplied. The Engineer reserves the right to reject any load transfer device which he deems unsatisfactory for use.
2. **Joint Filler for Concrete Curbing:** Expansion joint filler shall be either preformed expansion joint filler or wood joint filler as indicated on the plans and shall conform to the following requirements:
- (a) Preformed expansion joint filler shall be the bituminous cellular type and shall conform to the requirements of AASHTO M 213.
 - (b) Boards for wood joint filler shall have 2 planed sides and shall be redwood, cypress or white pine. Redwood and cypress boards shall be of sound heartwood. White pine boards shall be of sound sapwood. Occasional small, sound knots and medium surface checks will be permitted provided the board is free of any defects that will impair its usefulness for the purpose intended. The joint filler may be composed of more than one length of board in the length of the joint, but no board of a length less than 6 feet (1.9 meters) shall be used; and the separate boards shall be held securely to form a straight joint. Boards composed of pieces that are jointed and glued shall be considered as one board.
 - (c) Dimensions shall be as specified or shown on the plans; and tolerances of plus 1/16-inch (1.6 millimeters) thickness, plus 1/8-inch (3.2 millimeters) depth and plus 1/4-inch (6.4 millimeters) length will be permitted.
 - (d) All wood joint filler boards shall be given a preservative treatment by brushing with creosote oil conforming to AASHTO M 133. After treatment, the boards shall be stacked in piles, each layer separated from the next by spacers at least 1/4 inch (6.4 millimeters) thick; and the boards shall not be used until 24 hours after treatment. Prior to concreting, all exposed surfaces of the wood filler shall be given a light brush coating of form oil.
 - (e) Testing of board expansion joint filler shall be in accordance with pertinent sections of AASHTO T 42.
3. **Longitudinal Joint Devices:** The metal used in the fabrication of longitudinal joint devices shall conform to ASTM requirements for each type of metal used. The dimensions shall be as shown on the plans.
4. **Expansion Joint Fillers for Bridges and Bridge Bearings:**
- (a) Preformed expansion joint filler for bridges shall conform to the requirements of AASHTO M 153, Type I or Type II.
 - (b) Pre-molded expansion joint filler for bridge bearings shall conform to the requirements of AASHTO M 33.
5. **Joint Sealants:**
- (a) **Joint Sealer for Pavement:** The joint sealer for pavement shall be a rubber compound of the hot-poured type and shall conform to the requirements of AASHTO M 324 Type II unless otherwise noted on the plans or in the special provisions.
 - (b) **Joint Sealer for Structures:** Structure joint sealers shall be one of the following type sealants:
 - 1. Where "Joint Seal" is specified on the plans, it shall conform to the Federal Specifications SS-S-200-E (Self-leveling type), TT-S-0227E (COM-NBS) Type II-Class A (Non-sag type), or 1 component polyurethane-base elastomeric sealants conforming to FS TT-S-00230C Type II-Class A or an approved equal.

A Certified Test Report will be required in accordance with Article 1.06.07, certifying the conformance of the sealant to the requirements set forth in the Federal Specification. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify the shipment.

2. Where "Silicone Joint Sealant" is specified on the plans, it shall be one of the following or an approved equal:
 - Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan Dow Corning 888 Silicone Joint Sealant or
 - Dow Corning 888-SL Self-Leveling Silicone Joint 48686-0994
6. **Closed Cell Elastomer:** The closed cell elastomer shall conform to the requirements of ASTM D1056, Grade RE-41 B2. The elastomer shall have a pressure-sensitive adhesive backing on one side.

The Contractor shall deliver the closed cell elastomer to the job site a minimum of 30 days prior to installation. Prior to the delivery of the closed cell elastomer, the Contractor shall notify the Engineer of the date of shipment and the expected date of delivery. Upon delivery of the closed cell elastomer to the job site, the Contractor shall immediately notify the Engineer.

Each separate length, roll or container shall be clearly tagged or marked with the manufacturer's name, trademark and lot number. A lot is defined as that amount of closed cell elastomer manufactured at one time from one batch of elastomer. A batch is defined as that amount of elastomer prepared and compounded at one time. The Contractor shall furnish a Certified Test Report in accordance with Article 1.06.07, confirming the conformance of the closed cell elastomer to the requirements set forth in these specifications. Should the co-signee noted on a Certified Test Report be other than the Prime Contractor, a Materials Certificate shall be required to identify shipment.

The Contractor shall furnish a 1 foot (305 millimeter) length of closed cell elastomer in each lot for purposes of inspection and testing by the Engineer. The Engineer will cut a 1 foot (305 millimeter) sample from each lot and inspect the sample for conformance to size, and perform physical tests on the sample as deemed necessary.

The Engineer shall reject any lot or portion of a lot that does not conform to the requirements stated herein. A rejected lot or portion of a lot may be resubmitted provided the Contractor has removed or corrected, in a manner acceptable to the Engineer, all non-conforming material.

M.03.09 – Protective Compound/Sealers

The brand and type of material must be listed on the Department's Qualified Products List and approved by the Engineer for the specified use.

M.03.10 – Formwork

1. **Stay-in-place Forms:** Material for stay-in-place metal forms shall be made of zinc-coated (galvanized) steel sheet conforming to ASTM Specification A653 (Structural Steel (SS) Grade 33 through 80). The minimum thickness shall be 20 gage (810 micrometers). Coating weight shall conform to ASTM A924, Class G235, and shall otherwise meet all requirements relevant to steel stay-in-place metal forms and the placing of concrete as specified herein and as noted in the Contract documents.

Form supports shall either be fabricated and conform to the same material requirements as the forms, or be fabricated from structural steel conforming to the requirements of ASTM A36 and shall be hot-dip galvanized in accordance with ASTM A123.

Lightweight filler material for forms shall be as recommended by the form manufacturer.
2. **Temporary Forms and Falsework:** Forms and Falsework shall be of wood, steel or other material approved by the Engineer. This approval does not relieve the Contractor from employing adequately sized materials of sufficient rigidity to prevent objectionable distortion of the formed concrete surfaces caused by pressure of the plastic concrete and other loads incidental to the construction operations.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.06
METALS**

M.06.01 – Reinforcing Steel:

1. Bar Reinforcement:

Delete the third paragraph and replace it with:

“Epoxy coated bar reinforcement shall conform to the requirements of ASTM A 615/A 615M, Grade 60 (420) and shall be epoxy coated to the requirements of ASTM A 775/A 775M. All field repairs of the epoxy coating shall conform to the requirements of ASTM D 3963/D 3963M.”

M.06.02—Structural Steel and Other Structural Materials:

Delete the entire article and replace it with the following:

"M.06.02—Structural Steel: The materials for this work shall conform to the following requirements:

1. Structural Steel:

Structural steel for bridges shall conform to the designation shown on the plans. Unless otherwise indicated in the plans or specifications, structural steel for non-bridge related members or components shall conform to ASTM A709/A709M, Grade 36 (250).

All surfaces of steel plates and shapes used in the fabrication of bridge girders shall be blast cleaned and visually inspected by the Contractor prior to any fabrication or preparation for fabrication. Blast cleaning shall conform to the requirements of SSPC-SP-6-Commercial Blast.

All steel plates and shapes used in the fabrication of bridge girders shall be substantially free from pitting and gouges, regardless of the cause. Substantially free is defined as:

- The measured surface area of all pits and gouges regardless of depth represent less than 1% of the surface area of the plate or shape.
- No pit or gouge greater than 1/32 (0.08mm) inch deep.
- No pit or gouge closer than six inches (15.25 cm) from another.

Any repair of plates or shapes will be performed in accordance with ASTM A6/A 6M.

2. Anchor Bolts:

Unless otherwise designated on the plans, anchor bolts, including suitable nuts and washers, shall conform to the following requirements:

Anchor bolt assemblies shall conform to the requirements of ASTM F1554, Grade 36 (250). All components of the bolt assembly shall be galvanized in conformance with ASTM A 153/A 153M.

Certified Test Reports and Material Samples: The Contractor shall submit notarized copies of Certified Test Reports in conformance with Article 1.06.07. Prior to incorporation into the work, the Contractor shall submit samples of the anchor bolt assemblies to the Engineer for testing in accordance with the latest edition of the "Schedule of Minimum Requirements for Acceptance Testing". One sample shall be submitted for each diameter, material designation, grade or coating of anchor bolt assembly.

3. High Strength Bolts: High strength bolts, including suitable nuts and hardened washers, shall conform to the following requirements:

- a) High strength bolts shall conform to ASTM A325 or ASTM A490 as shown on the plans. High-strength bolts used with coated steel shall be mechanically galvanized, unless otherwise specified. High-strength bolts used with uncoated weathering grades of steel shall be Type 3.

Nuts for ASTM A325 bolts shall conform to ASTM A563, grades DH, DH3, C, C3 and D. Where galvanized high-strength bolts are used, the nuts shall be galvanized, heat treated grade DH or DH3. Where Type 3 high-strength bolts are used, the nuts shall be grade C3 or DH3.

Nuts for ASTM A490 bolts shall conform to the requirements of ASTM A563, grades DH and DH3. Where Type 3 high-strength bolts are used, the nuts shall be grade DH3.

All galvanized nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. Black bolts must be oily to the touch when delivered and installed.

Circular flat and square or rectangular beveled, hardened steel washers shall conform to ASTM F436. Unless otherwise specified, galvanized washers shall be furnished when galvanized high-strength bolts are specified, and washers with atmospheric corrosion resistance and weathering characteristics shall be furnished when Type 3 high-strength bolts are specified.

Compressible-washer-type direct tension indicator washers, used in conjunction with high strength bolts, shall conform to ASTM F959. Where galvanized high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 50. Where Type 3 high-strength bolts are used, the washers shall be galvanized in accordance with ASTM B695, Class 50 and coated with epoxy.

- b) Identifying Marks:** ASTM A325 for bolts and the specifications referenced therein for nuts require that bolts and nuts manufactured to the specification be identified by specific markings on the top of the bolt head and on one face of the nut. Head markings must identify the grade by the symbol "A325", the manufacturer and the type, if Type 2 or 3. Nut markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type "325". Other washer markings must identify the manufacturer and if Type 3, the type.

ASTM A490 for bolts and the specifications reference therein for nuts require that bolts and nuts manufactured to the specifications be identified by specific markings on the top of the bolt head and on one face of the nut. Head markings must identify the grade by the symbol "A490", the manufacturer and the type, if Type 2 or 3. Nut markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type "490". Other washer markings must identify the manufacturer and if Type 3, the type.

- c) Dimensions:** Bolt and nuts dimensions shall conform to the requirements for Heavy Hexagon Structural Bolts and for Heavy Semi-Finished Hexagon Nuts given in ANSI Standard B18.2.1 and B18.2.2, respectively.
- d) Galvanized Bolts:** Galvanized bolts shall conform to ASTM A325, Type 1. The bolts shall be hot-dip galvanized in accordance with ASTM A153, Class C or mechanically galvanized in accordance with ASTM B695, Class 50. Bolts, nuts, and washers of any assembly shall be galvanized by the same process. The nuts shall be overtapped to the minimum amount required for the fastener assembly, and shall be lubricated with a lubricant containing a visible dye so a visual check can be made for the lubricant at the time of field installation. Galvanized bolts shall be tension tested after galvanizing. ASTM A 490 bolts shall not be galvanized.
- e) Test Requirements:** The maximum hardness of A325 bolts 1" or less in diameter shall be 33 HRC.

Plain, ungalvanized nuts shall have a minimum hardness of 89 HRB.

Proof load tests, in accordance with the requirements of ASTM F606 Method 1, shall be required for the bolts. Wedge tests of full-size bolts are required in accordance with Section 8.3 of ASTM A325. Galvanized bolts shall be wedge tested after galvanizing. Proof load tests of ASTM A563 are required for nuts. Proof load tests for nuts used with galvanized bolts shall be performed after galvanizing, overtapping and lubricating.

Rotational-capacity tests are required and shall be performed on all plain or galvanized (after galvanizing) bolt, nut and washer assemblies by the manufacturer or distributor prior to shipping and by the Contractor at the job site.

The thickness of galvanizing on bolts, nuts and washers shall be measured. On bolts, it shall be measured on the wrench flats or on top of the bolt head, and on nuts it shall be measured on the wrench flats.

f) Certified Test Reports and Materials Certificates: The Contractor shall submit notarized copies of Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for fastener assemblies. In addition the Certified Test Reports and Materials Certificates shall include the following:

- a. Mill test reports shall indicate the place where the material was melted and manufactured.
- b. Test reports for proof load tests, wedge tests, and rotational-capacity tests shall indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.
- c. The test report for galvanized components shall indicate the thickness of the galvanizing.

g) Material Samples: Prior to incorporation into the work, the Contractor shall submit samples of the bolt assemblies to the Engineer for testing in accordance with the latest edition of the "Schedule of Minimum Requirements for Acceptance Testing". Samples shall be submitted for each diameter, length, material designation, grade, coating and manufacturer of bolt assembly.

4. Welded Stud Shear Connectors:

a) Materials: Stud shear connectors shall conform to the requirements of ASTM A 108, cold-drawn bar, Grades 1015, 1018 or 1020, either semi- or fully-killed. If flux-retaining caps are used, the steel for the caps shall be of a low carbon grade suitable for welding and shall comply with ASTM A 109.

Stud shear connectors shall be of a design suitable for electrically end-welding to steel with automatically timed stud welding equipment. The studs shall be of the sizes and dimensions noted on the plans. Flux for welding shall be furnished with each stud, either attached to the end of the stud or combined with the arc shield for automatic application in the welding operation. Each stud shall be furnished with a disposable ferrule of sufficient strength to remain intact during the welding operation and not crumble or break; it shall not be detrimental to the weld or create excessive slag.

Tensile properties, as determined by tests of bar stock after drawing or of finished studs, shall conform to the following requirements in which the yield strength is as determined by the 0.2% offset method:

Tensile strength (min.)	60,000 psi (415 megapascals)
Yield strength (min.)	50,000 psi (345 megapascals)
Elongation (min.)	20% in 2 inches (50 millimeters)
Reduction of area (min.)	50%

- b) Test Methods:** Tensile properties shall be determined in accordance with the applicable sections of ASTM A 370. Tensile tests of finished studs shall be made on studs welded to test plates using a test fixture similar to that shown in Figure 7.2 of the current AASHTO/AWS D1.5 – Bridge Welding Code. If fracture occurs outside of the middle half of the gage length, the test shall be repeated.
- c) Finish:** Finished studs shall be of uniform quality and condition, free from injurious laps, fins, seams, cracks, twists, bends or other injurious defects. Finish shall be as produced by cold-drawing, cold-rolling or machining.
- d) Certified Test Reports and Materials Certificates:** The Contractor shall submit a certified copy of the in-plant quality control test report in conformance with Article 1.06.07. The Contractor shall submit a Materials Certificate in conformance with Article 1.06.07 for the welded studs.
- e) Sample Materials for Testing:** Prior to incorporation into the work, the Contractor shall submit samples of the stud shear connectors to the Engineer for testing in accordance with the latest edition of the "Schedule of Minimum Requirements for Acceptance Testing". One sample shall be submitted for each diameter and length of welded stud."

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.08
DRAINAGE**

Delete the entire Section and replace with the following:

**SECTION M.08
DRAINAGE**

M.08.01 – Pipe

General

Iron/Steel

1. Cast Iron Pipe
2. Coated Corrugated Metal Pipe and Coated Corrugated Metal Pipe Elbows
3. Perforated or Plain Coated Metal Pipe for Underdrains or Outlets
4. Coated Corrugated Metal Pipe Arches
5. Corrugated Structural Plates and Bolts
6. Metal Culvert Ends

Concrete

7. Reinforced Concrete Pipe
8. Reinforced Concrete Elliptical Pipe
9. Perforated Reinforced Concrete Pipe for Underdrains and Outlets
10. Slotted Drain Pipe
11. Reinforced Concrete Culvert Ends

Aluminum

12. Corrugated Aluminum Pipe
13. Corrugated Aluminum Pipe for Underdrains and Outlets
14. Corrugated Aluminum Pipe Arches

Sealers/Gaskets

15. Cold-Applied Bituminous Sealer
16. Preformed Plastic Gaskets
17. Flexible, Watertight, Rubber-Type Gaskets

Plastic

18. Corrugated Polyethylene Pipe
19. Geotextiles
20. Polyvinyl Chloride Plastic Pipe
21. Polyvinyl Chloride Gravity Pipe

M.08.02 – Catch Basins, Manholes, and Drop Inlets

M.08.03 – Aggregates

1. Bedding Material
2. Aggregates for Underdrains

M.08.01 – Pipe

General

The Contractor shall submit manufacturer's material certifications for all metal and plastic pipes other than PVC, metal pipe-arches, metal fittings and metal coupling bands in accordance with Article 1.06.07.

IRON/STEEL

1. Cast Iron Pipe: This material shall conform to the requirements of AASHTO M 64 for Extra-Heavy Cast Iron Culvert Pipe.

2. Coated Corrugated Metal Pipe and Coated Corrugated Metal Pipe Elbows:
This material shall conform to the following:

Pipe fabricated from zinc-coated steel sheet and aluminum-coated (Type 2) steel sheet must conform to AASHTO M 36, Type 1 or IR.

Pipe fabricated from metallic-coated and polymer-precoated steel sheet must conform to AASHTO M 245, Type 1.

Unless otherwise indicated on the plans, the corrugation size and sheet thickness shall conform to the following:

Nominal Inside Diameter (inches)	Corrugations	Minimum Specified Sheet Thickness (inches)	
6	1 1/2" X 1/4"	.052	
8, 10	1 1/2" X 1/4"	.064	
12, 15, 18 & 21	2 2/3" X 1/2"	.064	
24, 30 , 36	2 2/3" X 1/2"	.079	
42, 48	2 2/3" X 1/2"	.109	
54, 60	3" X 1" or 5" X 1"	.064	
66, 72	3" X 1" or 5" X 1"	.079	
78, 84, 90, & 96	3" X 1" or 5" X 1"	.109	
		Steel	Aluminum
18, 24, 30	Helical Rib 3/4" X 3/4" X 7 1/2"	.064	.060
36	Helical Rib 3/4" X 3/4" X 7 1/2"	.064	.075
42, 48 & 54	Helical Rib 3/4" X 3/4" X 7 1/2"	.079	.105
60, 66, 72, 78, 84	Helical Rib 3/4" X 3/4" X 7 1/2"	.109	.135

Aluminum pipe sheet thickness may be .004 inch less than specified above for 1 1/2-inch x 1/4-inch, 2 2/3-inch x 1/2-inch and 3-inch x 1-inch or 5-inch x 1-inch corrugations. Helical Rib shall be as specified above.

Zinc coated steel pipe, fittings, and coupling bands shall be coated with bituminous material as specified in AASHTO M 190 Type C. Pipe, fittings and coupling bands

fabricated from aluminum coated steel sheet (Type 2) does not require coating of bituminous material or paved invert.

Metallic-coated and polymer-precoated steel pipe, fittings, and coupling bands shall be coated as specified in AASHTO M 246, Type B. The thicker polymeric coating shall be on the inside of the pipe.

Only one type of coating will be allowed for any continuously connected run of pipe.

If elongation of the pipe is required, it shall be done by the manufacturer.

3. Perforated or Plain Coated Metal Pipe for Underdrains or Outlets: This material shall conform to the requirements of AASHTO M 36, Type III or AASHTO M 245, Type III.

(a) Perforations: The minimum diameter of perforations after asphalt coating shall be 1/4 inch.

(b) Coating: All requirements of M.08.01-2 shall apply except that the minimum thickness of the bituminous coating on zinc coated steel pipe, fittings, and coupling bands pipe shall be 0.03 inches instead of 0.05 inches.

4. Coated Corrugated Metal Pipe-Arches: This material shall conform to the requirements of AASHTO M 36, Type II, Type IIR or AASHTO M 245, Type II. All coating requirements of M.08.01-1 shall apply.

Unless otherwise indicated on the plans, the corrugation size and sheet thickness shall conform to the following:

Pipe-Arch Equivalent Diameter (Inches)	Corrugations	Minimum Sheet Thickness (Inches)
15, 18, 21	2 2/3" X 1/2"	.064
24, 30	2 2/3" X 1/2"	.079
36, 42, 48	2 2/3" X 1/2"	.109
54, 60	2 2/3" X 1/2"	.138
60, 66, 72	3" X 1" or 5" X 1"	.079
78, 84, 90, 96	3" X 1" or 5" X 1"	.109
18, 21, 24	Helical Rib 3/4" X 3/4" X 7 1/2"	.064
30, 36	Helical Rib 3/4" X 3/4" X 7 1/2"	.079
42, 48, 54, 60	Helical Rib 3/4" X 3/4" X 7 1/2"	.109

5. Corrugated Structural Plates and Bolts: These plates and bolts are for use in the construction of metal pipe of the large diameter and for metal plate arches or pipe arches to be assembled in the field, and they shall conform to the requirements of AASHTO M 167 for corrugated metal pipe.

The dimensions of plates and details of fabrication shall conform to the requirements of the manufacturer. Where the plans call for a heavier gage for the bottom of the pipe than for the remainder of the pipe circumference, the lower fourth of the circumference shall be the minimum width of the heavier gage material.

The coating shall conform to the requirements of AASHTO M 243.

6. Metal Culvert End: The materials used in this work shall meet the pertinent requirements of Subarticles M.08.01-2 and M.08.01-4.

Bolts and fittings shall conform to the requirements of ASTM A 307 and shall be galvanized to conform to the requirements of ASTM A 153.

The units shall be coated as specified in Subarticles M.08.01-2, M.08.01-4 or M.08.01-5.

Fabrication: These units shall be formed from a rectangular sheet of metal by cutting and bending to form the desired shape. Two or more sheets may be fastened together by riveting or bolting so as to form a rectangular sheet of the required width. Skirt extensions and a top plate, as needed to complete the unit, shall be separately formed. Skirt extensions shall be riveted or bolted to the skirt.

All edges, which will be exposed above the surface of the ground, shall be reinforced before forming the unit by either of the following means:

- (1) The edge shall be bent to form a semicircular roll with an exterior diameter of 1 inch, as shown in the detail drawing on the plans.
- (2) A split tube of 1 inch outside diameter and not lighter than 14 gage, shall be slipped over a row of rivets spaced not more than 6 inches apart, as shown in the detail drawing on the plans.

One corrugation, matching the corrugations of the pipe or pipe-arch to which the unit is to be attached, shall be formed in the unit to insure secure and accurate alignment.

Attachment: The unit may be shop-riveted to a length of the appropriate pipe or pipe-arch, or may be field attached to the pipe or pipe arch by either of the other attachment systems shown on the plans, or by other means acceptable to the Engineer. If the unit is shop-riveted to a length of pipe or pipe-arch, this length shall be sufficient to permit proper use of standard coupling bands.

CONCRETE

7. Reinforced Concrete Pipe: Unless otherwise specified, this material shall conform to the requirements of AASHTO M 170, Class IV, as supplemented and modified by the following:

- (a) **Reinforcement:** In circular pipe, only circular reinforcement will be allowed.
- (b) **Laps and Welds:** The reinforcement shall be lapped not less than 2 inches and welded with an electric welding machine.
- (c) **Quality Assurance Testing:** Circular and elliptical reinforced concrete pipe shall be tested by the three-edge bearing method prescribed in AASHTO T 280, except as follows:
- 1) Modified or special design pipe shall be tested to the 0.01-inch load and the ultimate load requirements as per AASHTO M 170 and M 207.
 - 2) At the discretion of the Engineer, pipe of standard design, as specified in AASHTO M 170 and M 207, may be tested to the 0.01-inch requirement plus 10% additional load in lieu of ultimate load testing. Test pipe attaining a 0.01-inch crack will not be acceptable for use on Department projects.
 - 3) Cores for absorption and determination of steel reinforcement shall be taken on a random basis as determined by the Engineer. The cores shall be at least 6 inches in diameter.
- (d) **Inspection:** The pipe plant, materials, processes of manufacture and the finished pipe shall be subject to inspection and approval by the Department. The pipe manufacturer's records related to component materials, production and shipment of pipe for Department use shall be made available to the Department on request. The equipment and labor necessary for inspection, sampling and testing as required by the Department shall be furnished by the pipe manufacturer. Test equipment shall be calibrated at least once each 12 months, or as directed by the Engineer. The plant cement and aggregate scales shall be inspected and sealed by the approved agency at least once every twelve months.
- (e) **Preliminary Tests and Tests for Extended Deliveries:** As directed by the Engineer, the Department shall select for test from the stock of any manufacturer proposing to supply pipe to the Department, 2 of each size pipe up through 30-inch diameter and 1 of each size greater than 30-inch diameter. These sample pipes shall be tested under Department supervision by the three-edge bearing method. For pipe that fails, it shall be necessary for the manufacturer to either physically isolate the rejected pipe at his plant or to provide some means to clearly indicate the unacceptability of the pipe. Either method shall be performed to the satisfaction of the Engineer. When production is resumed on any size, wall thickness or class previously rejected, preliminary tests shall be required. If 95% of all pipe tested at a particular plant from the first of the calendar year to September 30 meet specifications, including both preliminary and extended tests, it will not be necessary to perform the Fall three-edge bearing tests at this plant.

Use of compression tests on representative cylinders or cores to determine the compressive strength of the concrete incorporated into the pipe products will be at the discretion of the Engineer.

(f) **Shipping:** Pipe shall not be shipped until it is at least 7 days old unless earlier shipment is authorized by the Engineer on the basis of tests.

(g) **Certification:** Pipe will be accepted by the Department on the basis of manufacturer's certification. The manufacturer shall certify each shipment of pipe on Department Form MAT-073(PC-1), "Certification of Precast Concrete Products." Two (2) copies of this certification shall be furnished with the shipment to the Engineer at the project site.

8. Reinforced Concrete Elliptical Pipe: This material shall conform to the requirements of AASHTO M 207, Class HE IV and supplemented as follows:

(a) Manufacturing and testing shall conform to Subarticle M.08.01-7.

9. Perforated Reinforced Concrete Pipe for Underdrains and Outlets: This material shall conform to the requirements of Subarticle M.08.01-7 and shall be slotted in accordance with AASHTO M 175, Type 2, or as shown on the plans. Pipe for outlets shall not be perforated.

10. Slotted Drain Pipe: The pipe shall be asphalt coated and conform to Subarticle M.08.01-2. Concrete shall conform to Article M.03.01, Class "A" or pavement type. Concrete shall be cured in conformance with M.03. The inlet aperture shall be longitudinal on top of the pipe and may be continuous or intermittent. The opening in the pipe wall may be fabricated in the form of continuous bar risers and spacers or of intermittent cut-out segments with structural members supporting a continuous grating as indicated in the plans. End caps shall be as provided by the manufacturer.

Elastomeric polymer sealer shall meet the physical requirements of ASTM D 3406 and be accepted on manufacturer's certification.

The pipe shall be helically corrugated with a continuous welded or lock seam. Pipe ends shall have 2 rolled annular corrugations on each end for jointing.

Bar Riser and Spacer Type: Riser assemblies shall be fabricated from structural steel, in accordance with the dimensions on the plans. The riser assemblies shall be hot dipped galvanized according to ASTM A123. The assemblies shall be welded to the corrugated pipe on each side of the riser at the location of the solid web spacers. The riser shall terminate 1 inch from the ends of each pipe length to allow clearance for single bolt coupling bands. The ends of the riser shall be closed with a suitable welded plate where solid web spacers do not come to the ends of the riser.

The maximum deviation from straight in both the vertical and horizontal plane of the riser assembly shall not exceed 3/4 inch in a 20-foot length.

Continuous Grating Type: The cut-out pipe segments shall provide a 2-inch wide slot of maximum length between the lock seams. The slot shall be left intact 1 inch on each side of the lock seam and this material shall be utilized to fasten the reinforcing bar in place.

A bent epoxy coated reinforcing bar shall cross the slotted opening on 6-inch centers.

The reinforcing bar shall be an ASTM A 615, No. 13, deformed bar epoxy coated with 7 mils of fusion bonded epoxy powder conforming to AASHTO M 284.

Grating shall be furnished unless noted in the contract documents. Grating and all bearing bars, cross bars, and bent connecting bars shall be welding quality, mild carbon steel conforming to ASTM A 569 and to the dimensions shown on the plans.

Tie down bolts shall be J-Type bolts, plated, ASTM A 307 steel supplied with self-locking nuts.

Concrete forms shall be of cellular foam plastic base, fabricated as an integral part of the pipe and reinforcing bar assembly. The form shall be capped with a thick wood or plastic cap resting on top of the foam plastic and reinforcing bar.

The maximum deviation from straight in both the vertical and horizontal plane of the completed assembly shall not exceed 3/4 inch in a 20-foot length. All grating and hardware shall be galvanized in conformance with Article M.06.03. Expansion joint filler shall conform to M.03.

11. Reinforced Concrete Culvert End: The barrel shall conform to the requirements of AASHTO M 170, Class II, except that the three-edge bearing tests will not be required. The flare shall be of the same thickness and materials as the barrel and shall have steel reinforcement equaling or exceeding the amount shown on the table for the pertinent size.

Tongues and grooves shall be compatible with tongues and grooves of pipe meeting AASHTO M 170, Class IV.

Air entrainment shall be added to these units so as to maintain 5 to 8% entrained air.

ALUMINUM

12. Corrugated Aluminum Pipe: This material shall conform to the requirements of AASHTO M 196 Type I or Type IR. Sheet thickness shall conform to the requirements of M.08.01-2.

13. Corrugated Aluminum Pipe for Underdrains and Outlets: This material shall conform to the requirements of AASHTO M 196, Type III or Type IIIR. Sheet thickness shall conform to the requirements of M.08.01-2. Pipe for outlets shall not be perforated.

14. Corrugated Aluminum Pipe Arches: These pipe arches shall conform to the requirements of AASHTO M 196, Type II or Type IIR. Sheet thickness shall conform to the requirements of M.08.01-4.

SEALERS/GASKETS

15. Cold-Applied Bituminous Sealer: This material, for use in sealing of joints in concrete pipes, shall be free of asbestos and shall meet the following requirements:

It shall be of such consistency that it may be spread on the joints with a trowel when

the temperature of the air is between -20° F and 100° F. The bituminous material shall adhere to the concrete pipe so as to make a watertight seal and shall not flow, crack or become brittle when exposed to the atmosphere.

Unless otherwise specified, sampling shall be done in accordance with AASHTO T 40.

The bituminous sealer shall be delivered to the project in suitable containers for handling and shall be sealed or otherwise protected from contamination. The container shall show the brand name, net mass or volume, and the requirements for application.

16. Preformed Plastic Gaskets: This material for use in sealing of joints in concrete pipe shall conform to the requirements of ASTM C 1478.

17. Flexible, Watertight, Rubber-Type Gaskets: This material for use in sealing concrete pipe joints shall conform to the requirements of ASTM C 443.

PLASTIC

18. Corrugated Polyethylene Pipe: Corrugated Polyethylene Pipe, either corrugated interior surface (Type C) or smooth interior surface (Type S) without perforations or with perforations (Type CP or SP), shall conform to AASHTO M 252 or M 294. Type D pipe shall have a smooth interior surface braced circumferentially or spirally with projections or ribs joined to a smooth outer wall. Both surfaces shall be fused to, or be continuous with, the internal supports. Type D shall conform to AASHTO M 294.

19. Geotextiles: The geotextile shall be non-rotting, acid and alkali resistant, and have sufficient strength and permeability for the purpose intended including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to delamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability. The geotextile shall also be free of any flaws or defects which will alter its physical properties. Torn or punctured geotextiles shall not be used. For each specific use, only geotextiles that are already on the Connecticut Department of Transportation's Qualified Products List for the geotextile type will be used. The Engineer reserves the right to reject any geotextile he deems unsatisfactory for a specific use. The brand name shall be labeled on the geotextile or the geotextile container. Geotextiles that are susceptible to damage from sunlight or heat shall be so identified by suitable warning information on the packaging material.

Geotextiles susceptible to sunlight damage shall not be used in any installations where exposure to light will exceed 30 days, unless specifically authorized in writing by the Engineer.

20. Polyvinyl Chloride Plastic Pipe: The pipe shall conform to the requirements of ASTM D 1785. Couplings and elbows shall conform to the requirements of ASTM D 2466 or D 2467.

21. Polyvinyl Chloride Gravity Pipe: This pipe shall conform to one of the following specifications: ASTM F789, ASTM F 679, or ASTM F 794.

M.08.02—Catch Basins, Manholes, and Drop Inlets: The materials to be used in the construction shall conform to the following:

1. Brick for Catch Basins, Manholes or Drop Inlets: Brick for catch basins, manholes or drop inlets shall conform to the requirements of ASTM C 32, except that the depth shall be 2 1/4 inches, the width 3 5/8 inches, and the length 8 inches, and except that the maximum water-absorption by 5-hour boiling shall not exceed the following limits:

Average of 5 bricks	15%
Individual brick	18%

2. Concrete Building Brick for Catch Basins, Manholes, or Drop Inlets: Concrete building brick for catch basins, manholes, or drop inlets shall conform to the requirements of ASTM C 55, Grade S II.

3. Masonry Concrete Units for Catch Basins, Manholes, or Drop Inlets: Masonry concrete units for catch basins, manholes, or drop inlets shall conform to the requirements of ASTM C 139.

4. Precast Units for Drainage Structures: Precast units for drainage structures may be used except where particular conditions require building or casting structures in place.

Fabrication plants shall have a quality control plan approved by the Division Chief of Materials Testing that is demonstrated to the satisfaction of the Engineer. The facility, the quality of materials, the process of fabrication, and the finished precast units shall be subject to inspection by the Engineer.

Precast manholes shall conform to the requirements of AASHTO M 199 (ASTM C 478).

Circular precast catch basins and drop inlets shall conform to AASHTO M 199 (ASTM C 478) as supplemented below. Rectangular precast catch basins and drop inlets shall conform to ASTM C 913 as supplemented below:

All materials used for concrete shall conform to the requirements of Section M.03.

The pertinent provisions of Article 6.01.03 shall apply except that the concrete shall contain 5.0%-8.0% entrained air. Water-absorption of individual cores taken from precast units shall be not more than 7%.

Reinforcement shall conform to the requirements of Article M.06.01.

Suitable provision shall be made in casting the units for convenient handling of the completed casting, and additional reinforcement steel shall be provided to allow for such handling in the casting yard and during transportation and placement. Each completed unit shall be identified with the name of manufacturer and date of the concrete pour from which it was cast, either by casting this information into an exposed face of the unit or by suitable stencil. For each day's production of precast units, the

fabricator shall mold, cure, and test standard cylinders, or cylinders compacted in a similar manner to the parent precast units, for the purpose of determining the compressive strength of the concrete incorporated into the precast units. Concrete used in molding the cylinders shall be representative of the concrete incorporated into the precast units during the production period. Cylinders shall be molded in accordance with AASHTO T 23, cured by the same method as the units they represent, and tested as prescribed in AASHTO T 22.

The fabricator shall determine the air content of the concrete used in the day's production of precast units by performing tests as prescribed in AASHTO T 152.

The equipment and personnel necessary to perform the required testing shall be furnished by the fabricator and approved by the Engineer. All testing equipment shall be calibrated at least once each 12 months or as directed by the Engineer. The fabricator shall maintain records relative to the production, testing, and shipment of precast units supplied to the Department. Said records shall be available to a representative of the Department upon his request.

The Department may accept precast concrete units on the basis of fabricator's certification. The fabricator shall certify each shipment of precast concrete units on Department Form MAT 314 (PC-1), "Certification of Precast Concrete Products." Two (2) copies of this certification shall be furnished with the shipment to the Engineer at the Project site.

Precast units that are cracked, show evidence of honeycomb, or have over 10% of their surface area patched may be subject to rejection, even though meeting other requirements.

5. Metal for Drainage Structures: Metal for catch basins, drop inlet and manhole frames, extensions, covers, and gratings shall be cast iron, cast steel, structural steel or malleable iron conforming to the requirements of the plans. Covers and gratings shall bear uniformly on their supports.

Extensions shall be designed so that the existing manhole cover or catch basin grate, when set in place, will have substantially the same bearing, fit, and load carrying capacity as in the existing frame. The extension shall be designed to fit into the original frame, resting specifically on the flange and rim area. The extension shall accept the existing cover or grate so that the cover or grate is seated firmly without movement.

Ladder rungs for manholes shall conform to AASHTO M 199 (ASTM C 478).

Cast iron shall conform to the requirements of AASHTO M 105, Class 25 for the frames and Class 30 for gratings.

Cast steel shall conform to the requirements of ASTM A 27, Grade optional, and shall be thoroughly annealed.

Structural Steel shall conform to the requirements of ASTM A 36, or A 283, Grade B or better, as to quality and details of fabrication, except that in the chemical composition of the steel, the 2/10 of 1% of copper may be omitted.

Malleable iron shall conform to the requirements of ASTM A 47, Grade 22010.

The materials and method of manufacture for drop inlets shall conform to the requirements as stated on the plans or as ordered.

M.08.03—Aggregates

1. Bedding Material: Material for pipe bedding shall be sand or sandy soil, all of which passes a 3/8-inch sieve and not more than 10% passes a No. 200 sieve.

When ground water is encountered, the Engineer may allow No. 6 stone conforming to Article M.01.01 to be used instead of sand or sandy soil.

2. Aggregates for Underdrains: Materials for filling the trench shall consist of well-graded, clean, non-plastic sands or well-graded, clean, durable broken stone or screened gravel. Unless otherwise noted, the type of material to be used shall be sand.

Sand: This material shall meet the requirements of Subarticle M.03.01-2

Broken Stone or Screened Gravel: This material shall conform to the gradation requirements for Size No. 8 under Article M.01.01.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.11
MASONRY FACING
CEMENT AND DRY RUBBLE MASONRY
BRICK
MORTAR**

M.11.01 – Masonry Facing:

1. Masonry Facing Stone:

Delete the third sentence:

“Preferably, the stone shall be from a quarry the product of which is known to be of satisfactory quality.”

Delete “2. : Vacant:”

M.11.04—Mortar:

Delete the entire article and replace it with the following:

M.11.04—Mortar: Mortar shall be either Pre-blended or Pre-packaged material conforming to:

ASTM C1714 - Standard Specification for Pre-blended Dry Mortar Mix for Unit Masonry;

ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar;

or be composed of one part Portland cement and two parts, by volume, of surface dry fine aggregate blended on site.

Hydrated lime, in an amount not to exceed 4 pounds (1.8 kilograms) of lime to each bag of cement, may be added when the material is blended on site at the option of the Engineer. Cement and hydrated lime shall conform to the following requirements:

(a) Portland cement, Types I, II or IS, and water shall conform to the requirements of Article M.03.

(b) Hydrated lime shall conform to the requirements of ASTM C 6.

When mortar is mixed on the project site, **fine aggregate** shall conform to Grading A or B as indicated in the table below, and to the requirements of Section M.03. For laying stone, precast units, or for shotcrete, fine aggregate shall conform to Grading A. For pointing stone or the precast units and for laying brick or sealing pipe joints, the fine aggregate shall conform to Grading B.

Table of Gradation, Fine Aggregate for Mortar

<u>Square Mesh Sieves</u>	<u>Grading</u>	
	A	B
	Percentage Passing by weight (mass)	
Pass 3/8 inch (9.5 millimeters)	100	
Pass #4 (4.75 millimeters)	95-100	
Pass #8 (2.36 millimeters)	80-100	100
Pass #16 (1.18 millimeters)	50-85	
Pass #30 (600 microns)	25-60	
Pass #50 (300 microns)	10-30	10-40
Pass #100 (150 microns)	2-10	0-10

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.13
ROADSIDE DEVELOPMENT**

M.13.01—Topsoil:

Delete the entire article and replace it with the following:

“ M.13.01 – Topsoil: The term topsoil used herein shall mean a soil meeting the soil textural classes established by the USDA Classification System based upon the proportion of sand, silt, and clay size particles after passing a No. 10 (2 millimeter) sieve and subjected to a particle size analysis. The topsoil shall contain 5% to 20% organic matter as determined by loss on ignition of oven-dried samples dried at 221° F (105° C). The pH range of the topsoil shall be 5.5 to 7.0.

The following textural classes shall be acceptable:

Loamy sand, including coarse, loamy fine, and loamy very fine sand, with not more than 80% sand
Sandy loam, including coarse, fine and very fine sandy loam
Loam
Clay loam, with not more than 30% clay
Silt loam, with not more than 60% silt
Sandy clay loam, with not more than 30% clay
All textural classes of topsoil with greater than 80% sand content will be rejected.

The topsoil furnished by the Contractor shall be a natural, workable soil that is screened and free of subsoil, refuse, stumps, roots, brush, weeds, rocks and stones over 1 1/4 inches (30 millimeters) in diameter, and any other foreign matter that would be detrimental to the proper development of plant growth.

The Contractor shall notify the Engineer of the location of the topsoil at least 15 calendar days prior to delivery. The topsoil and its source shall be inspected and approved by the Engineer before the material is delivered to the project. Any material delivered to the project, which does not meet specifications or which has become mixed with undue amounts of subsoil during any operation at the source or during placing and spreading, will be rejected and shall be replaced by the Contractor with acceptable material.

When topsoil is not furnished by the Contractor, it shall be material that is stripped in accordance with Section 2.02 or is furnished by the State, and will be tested as determined by the Engineer.

1. Planting Soil: Soil Material to be used for plant backfill shall be one of the following textural classes:

Loamy sand, with not more than 80% sand
Sandy loam
Loam
Clay loam, with not more than 30% clay
Silt loam, with not more than 60% silt
Sandy clay loam, with not more than 30% clay

Planting soil shall be premixed, consisting of approximately 50 % topsoil, 25 % compost or peat, and 25% native soil. Planting soil shall be loose, friable, and free from refuse, stumps, roots, brush, weeds, rocks and stones 2 inches (50 millimeters) in diameter. In addition, the material shall be free from any material that will prevent proper development and plant growth.

- (a) For ericaceous plants and broad-leaved evergreens requiring an acid soil, planting soil shall have a true pH of 4.5 to 5.5. If it has not, it shall be amended by the Contractor at his own expense to the proper pH range by mixing with sulphur.
- (b) Planting soil for general planting of nonacid-loving plants shall have a true pH value of 5.6 to 6.5. If it has not, it shall be amended by the Contractor at his own expense to the proper pH range by mixing with dolomitic limestone.

The amount of either sulphur or limestone required to adjust the planting soil to the proper pH range (above) shall be determined by the Engineer based on agronomic tests. The limestone shall conform to the requirements of Article M.13.02. The sulphur shall be commercial or flour sulphur, unadulterated, and shall be delivered in containers with the name of the manufacturer, material, analysis, and net weight (mass) appearing on each container.

The Engineer reserves the right to draw such samples and to perform such tests as he deems necessary to ensure that these specifications are met.”

M.13.03 – Fertilizer:

In the last sentence of the first paragraph change “AOAC International.” to “AOAC.”

M.13.04 – Seed Mixture:

Replace Subarticle (a) with the following:

“(a) The grass seed mixture shall conform to the following:

<u>Species</u>	<u>Proportion By Weight (Mass) Pounds (kilograms)</u>	<u>Minimum Purity (Percent)</u>	<u>Minimum Germination (Percent)</u>
VELVET BENTGRASS, (<u>AGROSTIS CANINA</u>) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY;	25 (9.1)	96	85
RED FESCUE (<u>FESTUCA RUBRA L. SSP. RUBRA</u>) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY	35 (15.9)	97	80
PARTRIDGE PEA (<u>CHAMAECRISTA FASCICULATA</u>) CERTIFIED VARIETY	10 (4.5)	95	90
INDIAN GRASS (<u>SORGHASTRUM NUTANS</u>) CERTIFIED VARIETY:	15 (5.45)	95	90
CANADA WILD RYE (<u>ELYMUS CANADENSIS</u>) CERTIFIED VARIETY:	5 (2.3)	95	90
KENTUCKY BLUE GRASS (<u>POA PRATENSIS</u>) CERTIFIED VARIETY:	10 (4.5)	95	90

Under no circumstances should annual Ryegrass, Italian Rye, or any other seed be added to the seed mixture.”

M.13.06 – Compost:

In the third to last sentence, replace “DEP” with “DEEP”.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.16
TRAFFIC CONTROL SIGNALS**

M.16.04 – Poles:

1. Steel Poles:

(i) Wire Entrance Fitting:

In the second sentence, delete “required to accept the cables”.

M.16.06 – Traffic Signals:

9. Painting:

In the first sentence, replace “MIL” with “MILSPEC”.

Subsection **Third Coat:**

Replace the first two sentences with the following:

“Dark Green Enamel: Shall be Dark Green exterior baked enamel and shall comply with FS A-A 2962. The color shall be No. 14056, FS No. 595.”

and in the third sentence replace “MIL” with “MILSPEC”.

M.16.08 – Pedestrian Push Button

In the last sentence of the second paragraph, change “Americans With Disabilities Act (ADA)” to “ADA”.

Subarticle **Painting**

Subsection **Third Coat:**

Delete the entire paragraph and replace it with the following:

“**Third Coat:** Dark Green Enamel, shall be DARK GREEN exterior-baking enamel and shall comply with Federal Specifications A-A 2962. The color shall be No. 14056, Federal Standard No. 595.”

M.16.10 – Flasher Cabinet:

1. Cabinet:

In subsection (f), change “Underwriter’s Laboratory” to “UL”.

M.16.15 – Messenger and Span Wire:

Delete the entire article and replace it with the following:

“M.16.15 – Messenger and Span Wire: The materials for this work shall conform to the following requirements:

1. Messenger wire shall be made of double-galvanized 7-strand utilities-grade steel wire cable, not less than 3/16 inch (4.8 millimeters) in diameter, with at least a 2,400-pound (10.7-kilonewton) breaking strength.
2. Span wire:
 - (a) “Span wire” shall be made of double-galvanized 7-strand utilities-grade steel wire cable, not less than 3/8 inch (9.5 millimeters) in diameter, with at least an 11,200-pound (50-kilonewton) breaking strength.
 - (b) “Span wire (high strength)” shall be made of double-galvanized 7-strand extra-high-strength-grade steel wire cable, not less than 7/16 inch (11.1 millimeters) in diameter, with at least a 20,800-pound (94-kilonewton) breaking strength.
3. All hardware accessories shown on the plans to be used in span wire or messenger mounting shall be made of high-strength, double-galvanized, first-quality materials.”

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.17
ELASTOMERIC MATERIALS**

M.17.01 – Elastomeric Bearing Pads:

2. Laminae:

In the last sentence of Subsection (a), replace “AAA 6061-T6” with “AA 6061-T6”.

4. Adhesive for Bonding:

In the 2nd paragraph of Subsection (b), replace “MS MIL” with “MILSPEC”.

**CONNECTICUT
SUPPLEMENTAL SPECIFICATION
SECTION M.18
SIGNING**

M.18.09—Reflective Sheeting:

Delete the entire article and replace with the following:

“ Reflective sheeting materials shall appear on the Department's Qualified Product List for the application intended and shall be in accordance with ASTM D4956.”

M.18.10—Demountable Copy:

2. Type III Sheeting

Change the title from “Type III Reflective Sheeting” to “Type IV Reflective Sheeting.”

In the first paragraph, change “Section M.18.09.01” to “Article M.18.09.”

3. Non-Reflective Plastic Sheeting:

H. Solvent and Chemical Resistance:

In the chart under this subsection, replace “MIL” with “MILSPEC.”

M.18.15—Sign-Mounting Bolts:

Delete the entire article and replace with the following:

“ Bolts used for sign-mounting shall be stainless steel and meet the requirements of ASTM F593, Group 1 or 2 (Alloy Types 304 or 316). Locking nuts shall be stainless steel and shall meet the requirements of ASTM F594, Group 1 or 2 (Alloy Types 304 or 316). Washers shall also be stainless steel and shall meet the requirements of ASTM A240 (Alloy Types 304 or 316).”

Construction Contracts - Required Contract Provisions (State Funded Only Contracts)

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 - a. Construction, Alteration or Repair of Public Works Projects; Wage Rates
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- EXHIBIT E - State Wage Rates (Attached at the end)

1. Title VI of the Civil Rights Act of 1964 / Nondiscrimination Requirements

The Contractor shall comply with Title VI of the Civil Rights Act of 1964 as amended (42 U.S.C. 2000 et seq.), all requirements imposed by the regulations of the United States Department of Transportation (49 CFR Part 21) issued in implementation thereof, and the Title VI Contractor Assurances attached hereto at Exhibit A, all of which are hereby made a part of this Contract.

2. Contractor Work Force Utilization / Equal Employment Opportunity

- (a) The Contractor shall comply with the Contractor Work Force Utilization / Equal Employment Opportunity requirements attached at Exhibit B and hereby made part of this Contract, whenever a contractor or subcontractor at any tier performs construction work in excess of \$10,000. These goals shall be included in each contract and subcontract. Goal achievement is calculated for each trade using the hours worked under each trade.
- (b) Companies with contracts, agreements or purchase orders valued at \$10,000 or more will develop and implement an Affirmative Action Plan utilizing the ConnDOT Affirmative Action Plan Guideline. This Plan shall be designed to further the provision of equal employment opportunity to all persons without regard to their race, color, religion, sex or national origin, and to promote the full realization of equal employment opportunity through a positive continuation program. Plans shall be updated as required by ConnDOT.

3. Contract Wage Rates

The Contractor shall comply with:

The State wage rate requirements indicated in Exhibit E hereof are hereby made part of this Contract.

Prevailing Wages for Work on State Highways; Annual Adjustments. With respect to contracts for work on state highways and bridges on state highways, the Contractor shall comply with the provisions of Section 31-54 and 31-55a of the Connecticut General Statutes, as revised.

As required by section 1.05.12 (Payrolls) of the State of Connecticut, Department of Transportation's Standard Specification for Roads, Bridges and Incidental Construction (FORM 816), as may be revised, every Contractor or subcontractor performing project work on a federal aid project is required to post the relevant prevailing wage rates as determined by the United States Secretary of Labor. The wage rate determinations shall be posted in prominent and easily accessible places at the work site.

4. Americans with Disabilities Act of 1990, as Amended

This provision applies to those Contractors who are or will be responsible for compliance with the terms of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. 12101 et seq.), (Act), during the term of the Contract. The Contractor represents that it is familiar with the terms of this Act and that it is in compliance with the Act. Failure of the Contractor to satisfy this standard as the same applies to performance under this Contract, either now or during the term of the Contract as it may be amended, will render the Contract voidable at the option of the State upon notice to the contractor. The Contractor warrants that it will hold the State harmless and indemnify the State from any liability which may be imposed upon the State as a result of any failure of the Contractor to be in compliance with this Act, as the same applies to performance under this Contract.

5. Connecticut Statutory Labor Requirements

(a) Construction, Alteration or Repair of Public Works Projects; Wage Rates. The Contractor shall comply with Section 31-53 of the Connecticut General Statutes, as revised. The wages paid on an hourly basis to any person performing the work of any mechanic, laborer or worker on the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such person to any employee welfare fund, as defined in subsection (i) of section 31-53 of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such public works project is being constructed. Any contractor who is not obligated by agreement to make payment or contribution on behalf of such persons to any such employee welfare fund shall pay to each mechanic, laborer or worker as part of such person's wages the amount of payment or contribution for such person's classification on each pay day.

(b) Debarment List. Limitation on Awarding Contracts. The Contractor shall comply with Section 31-53a of the Connecticut General Statutes, as revised.

(c) Construction Safety and Health Course. The Contractor shall comply with section 31-53b of the Connecticut General Statutes, as revised. The contractor shall furnish proof to the Labor Commissioner with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 of the Connecticut General Statutes, as revised, on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268.

Any employee required to complete a construction safety and health course as required that has not completed the course, shall have a maximum of fourteen (14) days to complete the course. If the employee has not been brought into compliance, they shall be removed from the project until such time as they have completed the required training.

Any costs associated with this notice shall be included in the general cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice. The contractor's compliance with this notice and any associated regulations shall not be grounds for claims as outlined in Section 1.11 – "Claims".

(d) Awarding of Contracts to Occupational Safety and Health Law Violators Prohibited. The Contract is subject to Section 31-57b of the Connecticut General Statutes, as revised.

(e) Residents Preference in Work on Other Public Facilities. NOT APPLICABLE TO FEDERAL AID CONTRACTS. Pursuant to Section 31-52a of the Connecticut General Statutes, as revised, in the employment of mechanics, laborers or workmen to perform the work specified herein, preference shall be given to residents of the state who are, and continuously for at least six months prior to the date hereof have been, residents of this state, and if no such person is available, then to residents of other states

6. Tax Liability - Contractor's Exempt Purchase Certificate (CERT – 141)

The Contractor shall comply with Chapter 219 of the Connecticut General Statutes pertaining to tangible personal property or services rendered that is/are subject to sales tax. The Contractor is responsible for determining its tax liability. If the Contractor purchases materials or supplies pursuant to the Connecticut Department of Revenue Services' "Contractor's Exempt Purchase Certificate (CERT-141)," as may be revised, the Contractor acknowledges and agrees that title to such materials and supplies installed or placed in the project will vest in the State simultaneously with passage of title from the retailers or vendors thereof, and the Contractor will have no property rights in the materials and supplies purchased.

Forms and instructions are available anytime by:

Internet: Visit the DRS website at www.ct.gov/DRS to download and print Connecticut tax forms; or Telephone: Call 1-800-382-9463 (Connecticut calls outside the Greater Hartford calling area only) and select Option 2 or call 860-297-4753 (from anywhere).

7. Executive Orders

This Contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill, promulgated June 16, 1971, concerning labor employment practices, Executive Order No. Seventeen of Governor Thomas J. Meskill, promulgated February 15, 1973, concerning the listing of employment openings and Executive Order No. Sixteen of Governor John G. Rowland promulgated August 4, 1999, concerning violence in the workplace, all of which are incorporated into and are made a part of the Contract as if they had been fully set forth in it. The Contract may also be subject to Executive Order No. 14 of Governor M. Jodi Rell, promulgated April 17, 2006, concerning procurement of cleaning products and services, in accordance with their respective terms and conditions. If Executive Order No. 14 is applicable, it is deemed to be incorporated into and made a part of the Contract as if it had been fully set forth in it. At the Contractor's request, the Department shall provide a copy of these orders to the Contractor.

8. Non Discrimination Requirement (pursuant to section 4a-60 and 4a-60a of the Connecticut General Statutes, as revised): References to "minority business enterprises" in this Section are not applicable to Federal-aid projects/contracts. Federal-aid projects/contracts are instead subject to the Federal Disadvantaged Business Enterprise Program.

(a) For purposes of this Section, the following terms are defined as follows:

- i. "Commission" means the Commission on Human Rights and Opportunities;
- ii. "Contract" and "contract" include any extension or modification of the Contract or contract;
- iii. "Contractor" and "contractor" include any successors or assigns of the Contractor or contractor;
- iv. "gender identity or expression" means a person's gender-related identity, appearance or behavior, whether or not that gender-related identity, appearance or behavior is different from that traditionally associated with the person's physiology or assigned sex at birth, which gender-related identity can be shown by providing evidence including, but not limited to, medical history, care or treatment of the gender-related identity, consistent and uniform assertion of the gender-related identity or any other evidence that the gender-related identity is sincerely held, part of a person's core identity or not being asserted for an improper purpose.

- v. "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations;
- vi. "good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements;
- vii. "marital status" means being single, married as recognized by the State of Connecticut, widowed, separated or divorced;
- viii. "mental disability" means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association's "Diagnostic and Statistical Manual of Mental Disorders", or a record of or regarding a person as having one or more such disorders;
- ix. "minority business enterprise" means any small contractor or supplier of materials fifty-one percent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise, and (3) who are members of a minority, as such term is defined in subsection (a) of Connecticut General Statutes § 32-9n; and
- x. "public works contract" means any agreement between any individual, firm or corporation and the State or any political subdivision of the State other than a municipality for construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, or which is financed in whole or in part by the State, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.

For purposes of this Section, the terms "Contract" and "contract" do not include a contract where each contractor is (1) a political subdivision of the State, including, but not limited to, a municipality, (2) a quasi-public agency, as defined in Conn. Gen. Stat. Section 1-120, (3) any other state, including but not limited to any federally recognized Indian tribal governments, as defined in Conn. Gen. Stat. Section 1-267, (4) the federal government, (5) a foreign government, or (6) an agency of a subdivision, agency, state or government described in the immediately preceding enumerated items (1), (2), (3), (4) or (5).

- (b) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the State of Connecticut; and the Contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, intellectual disability, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by the Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the Commission; (3) the Contractor agrees to provide each labor union or representative of workers with which the Contractor has a collective bargaining Agreement or other contract or understanding and each vendor with which the Contractor has a contract or

understanding, a notice to be provided by the Commission, advising the labor union or workers' representative of the Contractor's commitments under this section and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this Section and Connecticut General Statutes §§ 46a-68e and 46a-68f and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes §§ 46a-56, 46a-68e and 46a-68f; and (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this Section and Connecticut General Statutes § 46a-56. If the contract is a public works contract, the Contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works projects.

- (c) Determination of the Contractor's good faith efforts shall include, but shall not be limited to, the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the Commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.
- (d) The Contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission, of its good faith efforts.
- (e) The Contractor shall include the provisions of subsection (b) of this Section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes §46a-56; provided if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.
- (f) The Contractor agrees to comply with the regulations referred to in this Section as they exist on the date of this Contract and as they may be adopted or amended from time to time during the term of this Contract and any amendments thereto.
- (g) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or the State of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining Agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) the Contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes § 46a-56;

and (4) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor which relate to the provisions of this Section and Connecticut General Statutes § 46a-56.

- (h) The Contractor shall include the provisions of the foregoing paragraph in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes § 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.”

The Nondiscrimination Certifications can be found at the Office of Policy and Management website.

<http://www.ct.gov/opm/cwp/view.asp?a=2982&Q=390928>

9. Whistleblower Provision

The following clause is applicable if the Contract has a value of Five Million Dollars (\$5,000,000) or more.

Whistleblowing. This Contract may be subject to the provisions of Section 4-61dd of the Connecticut General Statutes. In accordance with this statute, if an officer, employee or appointing authority of the Contractor takes or threatens to take any personnel action against any employee of the Contractor in retaliation for such employee's disclosure of information to any employee of the contracting state or quasi-public agency or the Auditors of Public Accounts or the Attorney General under the provisions of subsection (a) of such statute, the Contractor shall be liable for a civil penalty of not more than five thousand dollars for each offense, up to a maximum of twenty per cent of the value of this Contract. Each violation shall be a separate and distinct offense and in the case of a continuing violation, each calendar day's continuance of the violation shall be deemed to be a separate and distinct offense. The State may request that the Attorney General bring a civil action in the Superior Court for the Judicial District of Hartford to seek imposition and recovery of such civil penalty. In accordance with subsection (f) of such statute, each large state contractor, as defined in the statute, shall post a notice of the provisions of the statute relating to large state contractors in a conspicuous place which is readily available for viewing by the employees of the Contractor.

10. Connecticut Freedom of Information Act

- (a) **Disclosure of Records.** This Contract may be subject to the provisions of section 1-218 of the Connecticut General Statutes. In accordance with this statute, each contract in excess of two million five hundred thousand dollars between a public agency and a person for the performance of a governmental function shall (a) provide that the public agency is entitled to receive a copy of records and files related to the performance of the governmental function, and (b) indicate that such records and files are subject to FOIA and may be disclosed by the public agency pursuant to FOIA. No request to inspect or copy such records or files shall be valid unless the request is made to the public agency in accordance with FOIA. Any complaint by a person who is denied the right to inspect or copy such records or files shall be brought to the Freedom of Information Commission in accordance with the provisions of sections 1-205 and 1-206 of the Connecticut General Statutes.

(b) Confidential Information. The State will afford due regard to the Contractor's request for the protection of proprietary or confidential information which the State receives from the Contractor. However, all materials associated with the Contract are subject to the terms of the FOIA and all corresponding rules, regulations and interpretations. In making such a request, the Contractor may not merely state generally that the materials are proprietary or confidential in nature and not, therefore, subject to release to third parties. Those particular sentences, paragraphs, pages or sections that the Contractor believes are exempt from disclosure under the FOIA must be specifically identified as such. Convincing explanation and rationale sufficient to justify each exemption consistent with the FOIA must accompany the request. The rationale and explanation must be stated in terms of the prospective harm to the competitive position of the Contractor that would result if the identified material were to be released and the reasons why the materials are legally exempt from release pursuant to the FOIA. To the extent that any other provision or part of the Contract conflicts or is in any way inconsistent with this section, this section controls and shall apply and the conflicting provision or part shall not be given effect. If the Contractor indicates that certain documentation is submitted in confidence, by specifically and clearly marking the documentation as "CONFIDENTIAL," DOT will first review the Contractor's claim for consistency with the FOIA (that is, review that the documentation is actually a trade secret or commercial or financial information and not required by statute), and if determined to be consistent, will endeavor to keep such information confidential to the extent permitted by law. See, *e.g.*, Conn. Gen. Stat. §1-210(b)(5)(A-B). The State, however, has no obligation to initiate, prosecute or defend any legal proceeding or to seek a protective order or other similar relief to prevent disclosure of any information that is sought pursuant to a FOIA request. Should the State withhold such documentation from a Freedom of Information requester and a complaint be brought to the Freedom of Information Commission, the Contractor shall have the burden of cooperating with DOT in defense of that action and in terms of establishing the availability of any FOIA exemption in any proceeding where it is an issue. In no event shall the State have any liability for the disclosure of any documents or information in its possession which the State believes are required to be disclosed pursuant to the FOIA or other law.

11. Service of Process

The Contractor, if not a resident of the State of Connecticut, or, in the case of a partnership, the partners, if not residents, hereby appoints the Secretary of State of the State of Connecticut, and his successors in office, as agent for service of process for any action arising out of or as a result of this Contract; such appointment to be in effect throughout the life of this Contract and six (6) years thereafter.

12. Substitution of Securities for Retainages on State Contracts and Subcontracts

This Contract is subject to the provisions of Section 3-112a of the General Statutes of the State of Connecticut, as revised.

13. Health Insurance Portability and Accountability Act of 1996 (HIPAA)

The Contractor shall comply, if applicable, with the Health Insurance Portability and Accountability Act of 1996 and, pursuant thereto, the provisions attached at Exhibit C, and hereby made part of this Contract.

14. Forum and Choice of Law

Forum and Choice of Law. The parties deem the Contract to have been made in the City of Hartford, State of Connecticut. Both parties agree that it is fair and reasonable for the validity and construction of the Contract to be, and it shall be, governed by the laws and court decisions of the State of Connecticut, without giving effect to its principles of conflicts of laws. To the extent that any immunities provided by Federal law or the laws of the State of Connecticut do not bar an action against the State, and to the extent that these courts are courts of competent jurisdiction, for the purpose of venue, the complaint shall be made returnable to the Judicial District of Hartford only or shall be brought in the United States District Court for the District of Connecticut only, and shall not be transferred to any other court, provided, however, that nothing here constitutes a waiver or compromise of the sovereign immunity of the State of Connecticut. The Contractor waives any objection which it may now have or will have to the laying of venue of any Claims in any forum and further irrevocably submits to such jurisdiction in any suit, action or proceeding.

15. Summary of State Ethics Laws

Pursuant to the requirements of section 1-101qq of the Connecticut General Statutes, the summary of State ethics laws developed by the State Ethics Commission pursuant to section 1-81b of the Connecticut General Statutes is incorporated by reference into and made a part of the Contract as if the summary had been fully set forth in the Contract.

16. Audit and Inspection of Plants, Places of Business and Records

- (a) The State and its agents, including, but not limited to, the Connecticut Auditors of Public Accounts, Attorney General and State's Attorney and their respective agents, may, at reasonable hours, inspect and examine all of the parts of the Contractor's and Contractor Parties' plants and places of business which, in any way, are related to, or involved in, the performance of this Contract. For the purposes of this Section, "Contractor Parties" means the Contractor's members, directors, officers, shareholders, partners, managers, principal officers, representatives, agents, servants, consultants, employees or any one of them or any other person or entity with whom the Contractor is in privity of oral or written contract and the Contractor intends for such other person or entity to Perform under the Contract in any capacity.
- (b) The Contractor shall maintain, and shall require each of the Contractor Parties to maintain, accurate and complete Records. The Contractor shall make all of its and the Contractor Parties' Records available at all reasonable hours for audit and inspection by the State and its agents.
- (c) The State shall make all requests for any audit or inspection in writing and shall provide the Contractor with at least twenty-four (24) hours' notice prior to the requested audit and inspection date. If the State suspects fraud or other abuse, or in the event of an emergency, the State is not obligated to provide any prior notice.
- (d) The Contractor shall keep and preserve or cause to be kept and preserved all of its and Contractor Parties' Records until three (3) years after the latter of (i) final payment under this Agreement, or (ii) the expiration or earlier termination of this Agreement, as the same may be modified for any reason. The State may request an audit or inspection at any time during this period. If any Claim or audit is started before the expiration of this period, the Contractor shall retain or cause to be retained all Records until all Claims or audit findings have been resolved.
- (e) The Contractor shall cooperate fully with the State and its agents in connection with an audit or inspection. Following any audit or inspection, the State may conduct and the Contractor shall cooperate with an exit conference.
- (f) The Contractor shall incorporate this entire Section verbatim into any contract or other agreement that it enters into with any Contractor Party.

17. Campaign Contribution Restriction

For all State contracts, defined in Conn. Gen. Stat. §9-612(f)(1) as having a value in a calendar year of \$50,000 or more, or a combination or series of such agreements or contracts having a value of \$100,000 or more, the authorized signatory to this contract expressly acknowledges receipt of the State Elections Enforcement Commission's notice advising state contractors of state campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice, as set forth in "Notice to Executive Branch State Contractors and Prospective State Contractors of Campaign Contribution and Solicitation Limitations," a copy of which is attached hereto and hereby made a part of this contract, attached as Exhibit D.

18. Tangible Personal Property

- (a) The Contractor on its behalf and on behalf of its Affiliates, as defined below, shall comply with the provisions of Conn. Gen. Stat. §12-411b, as follows:
- (1) For the term of the Contract, the Contractor and its Affiliates shall collect and remit to the State of Connecticut, Department of Revenue Services, any Connecticut use tax due under the provisions of Chapter 219 of the Connecticut General Statutes for items of tangible personal property sold by the Contractor or by any of its Affiliates in the same manner as if the Contractor and such Affiliates were engaged in the business of selling tangible personal property for use in Connecticut and had sufficient nexus under the provisions of Chapter 219 to be required to collect Connecticut use tax;
 - (2) A customer's payment of a use tax to the Contractor or its Affiliates relieves the customer of liability for the use tax;
 - (3) The Contractor and its Affiliates shall remit all use taxes they collect from customers on or before the due date specified in the Contract, which may not be later than the last day of the month next succeeding the end of a calendar quarter or other tax collection period during which the tax was collected;
 - (4) The Contractor and its Affiliates are not liable for use tax billed by them but not paid to them by a customer; and
 - (5) Any Contractor or Affiliate who fails to remit use taxes collected on behalf of its customers by the due date specified in the Contract shall be subject to the interest and penalties provided for persons required to collect sales tax under chapter 219 of the general statutes.
- (b) For purposes of this section of the Contract, the word "Affiliate" means any person, as defined in section 12-1 of the general statutes, that controls, is controlled by, or is under common control with another person. A person controls another person if the person owns, directly or indirectly, more than ten per cent of the voting securities of the other person. The word "voting security" means a security that confers upon the holder the right to vote for the election of members of the board of directors or similar governing body of the business, or that is convertible into, or entitles the holder to receive, upon its exercise, a security that confers such a right to vote. "Voting security" includes a general partnership interest.
- (c) The Contractor represents and warrants that each of its Affiliates has vested in the Contractor plenary authority to so bind the Affiliates in any agreement with the State of Connecticut. The Contractor on its own behalf and on behalf of its Affiliates shall also provide, no later than 30 days after receiving a request by the State's contracting authority, such information as the State may require to ensure, in the State's sole determination, compliance with the provisions of Chapter 219 of the Connecticut General Statutes, including, but not limited to, §12-411b.

19. Bid Rigging and/or Fraud – Notice to Contractor

The Connecticut Department of Transportation is cooperating with the U.S. Department of Transportation and the Justice Department in their investigation into highway construction contract bid rigging and/or fraud.

A toll-free “HOT LINE” telephone number 800-424-9071 has been established to receive information from contractors, subcontractors, manufacturers, suppliers or anyone with knowledge of bid rigging and/or fraud, either past or current. The “HOT LINE” telephone number will be available during normal working hours (8:00 am – 5:00 pm EST). Information will be treated confidentially and anonymity respected.

20. Consulting Agreement Affidavit

The Contractor shall comply with Connecticut General Statutes Section 4a-81(a) and 4a-81(b), as revised. Pursuant to Public Act 11-229, after the initial submission of the form, if there is a change in the information contained in the form, a contractor shall submit the updated form, as applicable, either (i) not later than thirty (30) days after the effective date of such change or (ii) prior to execution of any new contract, whichever is earlier.

The Affidavit/Form may be submitted in written format or electronic format through the Department of Administrative Services (DAS) website.

EXHIBIT A

TITLE VI CONTRACTOR ASSURANCES

During the performance of this Contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:

1. Compliance with Regulations: The Contractor shall comply with the regulations relative to nondiscrimination in federally assisted programs of the United States Department of Transportation (hereinafter, "USDOT"), Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the "Regulations"), which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination: The Contractor, with regard to the work performed by it during the Contract, shall not discriminate on the grounds of race, color, national origin, sex, age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by Subsection 5 of the Regulations, including employment practices when the Contract covers a program set forth in Appendix B of the Regulations.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment:

In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, national origin, sex, age, or disability.

4. Information and Reports: The Contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Connecticut Department of Transportation (ConnDOT) or the Funding Agency (FHWA, FTA and FAA) to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to ConnDOT or the Funding Agency, as appropriate, and shall set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Contract, the ConnDOT shall impose such sanctions as it or the Funding Agency may determine to be appropriate, including, but not limited to:

- A. Withholding contract payments until the Contractor is in-compliance; and/or
- B. Cancellation, termination, or suspension of the Contract, in whole or in part.

6. Incorporation of Provisions: The Contractor shall include the provisions of paragraphs 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the ConnDOT or the Funding Agency may -direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request the ConnDOT to enter into such litigation to protect the interests of the Funding Agency, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States

EXHIBIT B**CONTRACTOR WORKFORCE UTILIZATION / EQUAL EMPLOYMENT OPPORTUNITY****1. Project Workforce Utilization Goals:**

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted or funded) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where the work is actually performed.

Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications which contain the applicable goals for minority and female participation.

The goals for minority and female utilization are expressed in percentage terms for the contractor's aggregate work-force in each trade on all construction work in the covered area, are referenced in the Appendix A below.

STATE FUNDED PROJECTS (only)**APPENDIX A****(Labor Market Goals)****LABOR MARKET AREA GOAL**
Female**Minority**

Bridgeport				14%
6.9%				
Ansonia	Beacon Falls	Bridgeport	Derby	
Easton	Fairfield	Milford	Monroe	
Oxford	Seymour	Shelton	Stratford	
Trumbull				
Danbury				4%
6.9%				
Bethel	Bridgewater	Brookfield	Danbury	
Kent	New Fairfield	New Milford	Newtown	
Redding	Ridgefield	Roxbury	Sherman	
Washington				
Danielson				2%
6.9%				
Brooklyn	Eastford	Hampton	Killingly	
Pomfret	Putnam	Scotland	Sterling	
Thompson	Voluntown	Union	Woodstock	
Hartford				15%
6.9%				

Andover	Ashford	Avon	Barkhamsted
Belin	Bloomfield	Bolton	Bristol
Burlington	Canton	Chaplin	Colchester
Columbia	Coventry	Cromwell	Durham
East Granby	East Haddam	East Hampton	East Hartford
East Windsor	Ellington	Enfield	Farmington
Glastonbury	Granby	Haddam	Hartford
Harwinton	Hebron	Lebanon	Manchester
Mansfield	Marlborough	Middlefield	Middletown
Newington	Plainville	Plymouth	Portland
Rocky Hill	Simsbury	Somers	South Windsor
Southington	Stafford	Suffield	Tolland
Vernon	West Hartford	Wethersfield	Willington
Winchester	Windham	Windsor	Windsor Locks

Lower River
6.9%

2%

Chester	Deep River	Essex	Old Lyme
Westbrook			

New Haven
6.9%

14%

Bethany	Branford	Cheshire	Clinton
East Haven	Guilford	Hamden	Killingworth
Madison	Meriden	New Haven	North Branford
North Haven	Orange	Wallingford	West Haven
Woodbridge			

New London
6.9%

8%

Bozrah	Canterbury	East Lyme	Franklin
Griswold	Groton	Ledyard	Lisbon
Montville	New London	North Stonington	Norwich
Old Lyme	Old Saybrook	Plainfield	Preston
Salem	Sprague	Stonington	Waterford
Hopkinton	RI – Westerly Rhode Island		

Stamford
6.9%

17%

Darien	Greenwich	New Canaan	Norwalk
Stamford	Weston	Westport	Wilton

Torrington
6.9%

2%

Canaan	Colebrook	Cornwall	Goshen
Hartland	Kent	Litchfield	Morris
Norfolk	North Canaan	Salisbury	Sharon
Torrington	Warren		

Waterbury				10%
6.9%				
Bethlehem	Middlebury	Naugatuck	Prospect	
Southbury	Thomaston	Waterbury	Watertown	
Wolcott	Woodbury			

EXHIBIT C

Health Insurance Portability and Accountability Act of 1996 (“HIPAA”).

- (a) If the Contactor is a Business Associate under the requirements of the Health Insurance Portability and Accountability Act of 1996 (“HIPAA”), the Contractor must comply with all terms and conditions of this Section of the Contract. If the Contractor is not a Business Associate under HIPAA, this Section of the Contract does not apply to the Contractor for this Contract.
- (b) The Contractor is required to safeguard the use, publication and disclosure of information on all applicants for, and all clients who receive, services under the Contract in accordance with all applicable federal and state law regarding confidentiality, which includes but is not limited to HIPAA, more specifically with the Privacy and Security Rules at 45 C.F.R. Part 160 and Part 164, subparts A, C, and E; and
- (c) The State of Connecticut Agency named on page 1 of this Contract (hereinafter the “Department”) is a “covered entity” as that term is defined in 45 C.F.R. § 160.103; and
- (d) The Contractor, on behalf of the Department, performs functions that involve the use or disclosure of “individually identifiable health information,” as that term is defined in 45 C.F.R. § 160.103; and
- (e) The Contractor is a “business associate” of the Department, as that term is defined in 45 C.F.R. § 160.103; and
- (f) The Contractor and the Department agree to the following in order to secure compliance with the HIPAA, the requirements of Subtitle D of the Health Information Technology for Economic and Clinical Health Act (hereinafter the HITECH Act), (Pub. L. 111-5, sections 13400 to 13423), and more specifically with the Privacy and Security Rules at 45 C.F.R. Part 160 and Part 164, subparts A, C, and E.
- (g) Definitions
 - (1) “Breach shall have the same meaning as the term is defined in section 13400 of the HITECH Act (42 U.S.C. §17921(1))
 - (2) “Business Associate” shall mean the Contractor.
 - (3) “Covered Entity” shall mean the Department of the State of Connecticut named on page 1 of this Contract.
 - (4) “Designated Record Set” shall have the same meaning as the term “designated record set” in 45 C.F.R. § 164.501.
 - (5) “Electronic Health Record” shall have the same meaning as the term is defined in section 13400 of the HITECH Act (42 U.S.C. §17921(5))

- (6) "Individual" shall have the same meaning as the term "individual" in 45 C.F.R. § 160.103 and shall include a person who qualifies as a personal representative as defined in 45 C.F.R. § 164.502(g).
 - (7) "Privacy Rule" shall mean the Standards for Privacy of Individually Identifiable Health Information at 45 C.F.R. part 160 and parts 164, subparts A and E.
 - (8) "Protected Health Information" or "PHI" shall have the same meaning as the term "protected health information" in 45 C.F.R. § 160.103, limited to information created or received by the Business Associate from or on behalf of the Covered Entity.
 - (9) "Required by Law" shall have the same meaning as the term "required by law" in 45 C.F.R. § 164.103.
 - (10) "Secretary" shall mean the Secretary of the Department of Health and Human Services or his designee.
 - (11) "More stringent" shall have the same meaning as the term "more stringent" in 45 C.F.R. § 160.202.
 - (12) "This Section of the Contract" refers to the HIPAA Provisions stated herein, in their entirety.
 - (13) "Security Incident" shall have the same meaning as the term "security incident" in 45 C.F.R. § 164.304.
 - (14) "Security Rule" shall mean the Security Standards for the Protection of Electronic Protected Health Information at 45 C.F.R. part 160 and parts 164, subpart A and C.
 - (15) "Unsecured protected health information" shall have the same meaning as the term as defined in section 13402(h)(1)(A) of HITECH. Act. (42 U.S.C. § 17932(h)(1)(A)).
- (h) Obligations and Activities of Business Associates.
- (1) Business Associate agrees not to use or disclose PHI other than as permitted or required by this Section of the Contract or as Required by Law.
 - (2) Business Associate agrees to use appropriate safeguards to prevent use or disclosure of PHI other than as provided for in this Section of the Contract.
 - (3) Business Associate agrees to use administrative, physical and technical safeguards that reasonably and appropriately protect the confidentiality, integrity, and availability of electronic protected health information that it creates, receives, maintains, or transmits on behalf of the Covered Entity.
 - (4) Business Associate agrees to mitigate, to the extent practicable, any harmful effect that is known to the Business Associate of a use or disclosure of PHI by Business Associate in violation of this Section of the Contract.

- (5) Business Associate agrees to report to Covered Entity any use or disclosure of PHI not provided for by this Section of the Contract or any security incident of which it becomes aware.
- (6) Business Associate agrees to insure that any agent, including a subcontractor, to whom it provides PHI received from, or created or received by Business Associate, on behalf of the Covered Entity, agrees to the same restrictions and conditions that apply through this Section of the Contract to Business Associate with respect to such information.
- (7) Business Associate agrees to provide access, at the request of the Covered Entity, and in the time and manner agreed to by the parties, to PHI in a Designated Record Set, to Covered Entity or, as directed by Covered Entity, to an Individual in order to meet the requirements under 45 C.F.R. § 164.524.
- (8) Business Associate agrees to make any amendments to PHI in a Designated Record Set that the Covered Entity directs or agrees to pursuant to 45 C.F.R. § 164.526 at the request of the Covered Entity, and in the time and manner agreed to by the parties.
- (9) Business Associate agrees to make internal practices, books, and records, including policies and procedures and PHI, relating to the use and disclosure of PHI received from, or created or received by, Business Associate on behalf of Covered Entity, available to Covered Entity or to the Secretary in a time and manner agreed to by the parties or designated by the Secretary, for purposes of the Secretary determining Covered Entity's compliance with the Privacy Rule.
- (10) Business Associate agrees to document such disclosures of PHI and information related to such disclosures as would be required for Covered Entity to respond to a request by an Individual for an accounting of disclosures of PHI in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder.
- (11) Business Associate agrees to provide to Covered Entity, in a time and manner agreed to by the parties, information collected in accordance with clause h. (10) of this Section of the Contract, to permit Covered Entity to respond to a request by an Individual for an accounting of disclosures of PHI in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder. Business Associate agrees at the Covered Entity's direction to provide an accounting of disclosures of PHI directly to an individual in accordance with 45 C.F.R. § 164.528 and section 13405 of the HITECH Act (42 U.S.C. § 17935) and any regulations promulgated thereunder.
- (12) Business Associate agrees to comply with any state or federal law that is more stringent than the Privacy Rule.
- (13) Business Associate agrees to comply with the requirements of the HITECH Act relating to privacy and security that are applicable to the Covered Entity and with the requirements of 45 C.F.R. sections 164.504(e), 164.308, 164.310, 164.312, and 164.316.

- (14) In the event that an individual requests that the Business Associate (a) restrict disclosures of PHI; (b) provide an accounting of disclosures of the individual's PHI; or (c) provide a copy of the individual's PHI in an electronic health record, the Business Associate agrees to notify the covered entity, in writing, within two business days of the request.
- (15) Business Associate agrees that it shall not, directly or indirectly, receive any remuneration in exchange for PHI of an individual without (1) the written approval of the covered entity, unless receipt of remuneration in exchange for PHI is expressly authorized by this Contract and (2) the valid authorization of the individual, except for the purposes provided under section 13405(d)(2) of the HITECH Act,(42 U.S.C. § 17935(d)(2)) and in any accompanying regulations

(16) Obligations in the Event of a Breach

- A. The Business Associate agrees that, following the discovery of a breach of unsecured protected health information, it shall notify the Covered Entity of such breach in accordance with the requirements of section 13402 of HITECH (42 U.S.C. 17932(b) and the provisions of this Section of the Contract.
- B. Such notification shall be provided by the Business Associate to the Covered Entity without unreasonable delay, and in no case later than 30 days after the breach is discovered by the Business Associate, except as otherwise instructed in writing by a law enforcement official pursuant to section 13402 (g) of HITECH (42 U.S.C. 17932(g)) . A breach is considered discovered as of the first day on which it is, or reasonably should have been, known to the Business Associate. The notification shall include the identification and last known address, phone number and email address of each individual (or the next of kin of the individual if the individual is deceased) whose unsecured protected health information has been, or is reasonably believed by the Business Associate to have been, accessed, acquired, or disclosed during such breach.
- C. The Business Associate agrees to include in the notification to the Covered Entity at least the following information:
1. A brief description of what happened, including the date of the breach and the date of the discovery of the breach, if known.
 2. A description of the types of unsecured protected health information that were involved in the breach (such as full name, Social Security number, date of birth, home address, account number, or disability code).
 3. The steps the Business Associate recommends that individuals take to protect themselves from potential harm resulting from the breach.
 4. A detailed description of what the Business Associate is doing to investigate the breach, to mitigate losses, and to protect against any further breaches.
 5. Whether a law enforcement official has advised either verbally or in writing the Business Associate that he or she has determined that notification or notice to

individuals or the posting required under section 13402 of the HITECH Act would impede a criminal investigation or cause damage to national security and; if so, include contact information for said official.

- D. Business Associate agrees to provide appropriate staffing and have established procedures to ensure that individuals informed by the Covered Entity of a breach by the Business Associate have the opportunity to ask questions and contact the Business Associate for additional information regarding the breach. Such procedures shall include a toll-free telephone number, an e-mail address, a posting on its Web site and a postal address. Business Associate agrees to include in the notification of a breach by the Business Associate to the Covered Entity, a written description of the procedures that have been established to meet these requirements. Costs of such contact procedures will be borne by the Contractor.
 - E. Business Associate agrees that, in the event of a breach, it has the burden to demonstrate that it has complied with all notifications requirements set forth above, including evidence demonstrating the necessity of a delay in notification to the Covered Entity.
- (i) Permitted Uses and Disclosure by Business Associate.
- (1) General Use and Disclosure Provisions Except as otherwise limited in this Section of the Contract, Business Associate may use or disclose PHI to perform functions, activities, or services for, or on behalf of, Covered Entity as specified in this Contract, provided that such use or disclosure would not violate the Privacy Rule if done by Covered Entity or the minimum necessary policies and procedures of the Covered Entity.
 - (2) Specific Use and Disclosure Provisions
 - (A) Except as otherwise limited in this Section of the Contract, Business Associate may use PHI for the proper management and administration of Business Associate or to carry out the legal responsibilities of Business Associate.
 - (B) Except as otherwise limited in this Section of the Contract, Business Associate may disclose PHI for the proper management and administration of Business Associate, provided that disclosures are Required by Law, or Business Associate obtains reasonable assurances from the person to whom the information is disclosed that it will remain confidential and used or further disclosed only as Required by Law or for the purpose for which it was disclosed to the person, and the person notifies Business Associate of any instances of which it is aware in which the confidentiality of the information has been breached.
 - (C) Except as otherwise limited in this Section of the Contract, Business Associate may use PHI to provide Data Aggregation services to Covered Entity as permitted by 45 C.F.R. § 164.504(e)(2)(i)(B).
- (j) Obligations of Covered Entity.

- (1) Covered Entity shall notify Business Associate of any limitations in its notice of privacy practices of Covered Entity, in accordance with 45 C.F.R. § 164.520, or to the extent that such limitation may affect Business Associate's use or disclosure of PHI.
 - (2) Covered Entity shall notify Business Associate of any changes in, or revocation of, permission by Individual to use or disclose PHI, to the extent that such changes may affect Business Associate's use or disclosure of PHI.
 - (3) Covered Entity shall notify Business Associate of any restriction to the use or disclosure of PHI that Covered Entity has agreed to in accordance with 45 C.F.R. § 164.522, to the extent that such restriction may affect Business Associate's use or disclosure of PHI.
- (k) Permissible Requests by Covered Entity. Covered Entity shall not request Business Associate to use or disclose PHI in any manner that would not be permissible under the Privacy Rule if done by the Covered Entity, except that Business Associate may use and disclose PHI for data aggregation, and management and administrative activities of Business Associate, as permitted under this Section of the Contract.
- (l) Term and Termination.
- (1) Term. The Term of this Section of the Contract shall be effective as of the date the Contract is effective and shall terminate when the information collected in accordance with clause h. (10) of this Section of the Contract is provided to the Covered Entity and all of the PHI provided by Covered Entity to Business Associate, or created or received by Business Associate on behalf of Covered Entity, is destroyed or returned to Covered Entity, or, if it is infeasible to return or destroy PHI, protections are extended to such information, in accordance with the termination provisions in this Section.
 - (2) Termination for Cause Upon Covered Entity's knowledge of a material breach by Business Associate, Covered Entity shall either:
 - (A) Provide an opportunity for Business Associate to cure the breach or end the violation and terminate the Contract if Business Associate does not cure the breach or end the violation within the time specified by the Covered Entity; or
 - (B) Immediately terminate the Contract if Business Associate has breached a material term of this Section of the Contract and cure is not possible; or
 - (C) If neither termination nor cure is feasible, Covered Entity shall report the violation to the Secretary.
 - (3) Effect of Termination
 - (A) Except as provided in (l)(2) of this Section of the Contract, upon termination of this Contract, for any reason, Business Associate shall return or destroy all PHI received from Covered Entity, or created or received by Business Associate on behalf of Covered Entity. Business Associate shall also provide the information collected in accordance with clause h. (10) of this Section of the Contract to the Covered Entity

within ten business days of the notice of termination. This provision shall apply to PHI that is in the possession of subcontractors or agents of Business Associate. Business Associate shall retain no copies of the PHI.

(B) In the event that Business Associate determines that returning or destroying the PHI is infeasible, Business Associate shall provide to Covered Entity notification of the conditions that make return or destruction infeasible. Upon documentation by Business Associate that return or destruction of PHI is infeasible, Business Associate shall extend the protections of this Section of the Contract to such PHI and limit further uses and disclosures of PHI to those purposes that make return or destruction infeasible, for as long as Business Associate maintains such PHI. Infeasibility of the return or destruction of PHI includes, but is not limited to, requirements under state or federal law that the Business Associate maintains or preserves the PHI or copies thereof.

(m) Miscellaneous Provisions.

(1) Regulatory References. A reference in this Section of the Contract to a section in the Privacy Rule means the section as in effect or as amended.

(2) Amendment. The Parties agree to take such action as is necessary to amend this Section of the Contract from time to time as is necessary for Covered Entity to comply with requirements of the Privacy Rule and the Health Insurance Portability and Accountability Act of 1996, Pub. L. No. 104-191.

(3) Survival. The respective rights and obligations of Business Associate shall survive the termination of this Contract.

(4) Effect on Contract. Except as specifically required to implement the purposes of this Section of the Contract, all other terms of the Contract shall remain in force and effect.

(5) Construction. This Section of the Contract shall be construed as broadly as necessary to implement and comply with the Privacy Standard. Any ambiguity in this Section of the Contract shall be resolved in favor of a meaning that complies, and is consistent with, the Privacy Standard.

(6) Disclaimer. Covered Entity makes no warranty or representation that compliance with this Section of the Contract will be adequate or satisfactory for Business Associate's own purposes. Covered Entity shall not be liable to Business Associate for any claim, civil or criminal penalty, loss or damage related to or arising from the unauthorized use or disclosure of PHI by Business Associate or any of its officers, directors, employees, contractors or agents, or any third party to whom Business Associate has disclosed PHI contrary to the provisions of this Contract or applicable law. Business Associate is solely responsible for all decisions made, and actions taken, by Business Associate regarding the safeguarding, use and disclosure of PHI within its possession, custody or control.

(7) Indemnification. The Business Associate shall indemnify and hold the Covered Entity harmless from and against any and all claims, liabilities, judgments, fines, assessments, penalties, awards and any statutory damages that may be imposed or assessed pursuant to HIPAA, as amended or the

HITECH Act, including, without limitation, attorney's fees, expert witness fees, costs of investigation, litigation or dispute resolution, and costs awarded thereunder, relating to or arising out of any violation by the Business Associate and its agents, including subcontractors, of any obligation of Business Associate and its agents, including subcontractors, under this section of the contract, under HIPAA, the HITECH Act, the Privacy Rule and the Security Rule.

Notice to Executive Branch State Contractors and Prospective State Contractors of Campaign Contribution and Solicitation Limitations

This notice is provided under the authority of Connecticut General Statutes §9-612(g)(2), as amended by P.A. 10-1, and is for the purpose of informing state contractors and prospective state contractors of the following law (*italicized words are defined on the reverse side of this page*).

CAMPAIGN CONTRIBUTION AND SOLICITATION LIMITATIONS

No *state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor*, with regard to a *state contract or state contract solicitation* with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee (which includes town committees).

In addition, no holder or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of State senator or State representative, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

On and after January 1, 2011, no state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor, with regard to a state contract or state contract solicitation with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall **knowingly solicit** contributions from the state contractor's or prospective state contractor's employees or from a *subcontractor or principals of the subcontractor* on behalf of (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

DUTY TO INFORM

State contractors and prospective state contractors are required to inform their principals of the above prohibitions, as applicable, and the possible penalties and other consequences of any violation thereof.

PENALTIES FOR VIOLATIONS

Contributions or solicitations of contributions made in violation of the above prohibitions may result in the following civil and criminal penalties:

Civil penalties—Up to \$2,000 or twice the amount of the prohibited contribution, whichever is greater, against a principal or a contractor. Any state contractor or prospective state contractor which fails to make reasonable efforts to comply with the provisions requiring notice to its principals of these prohibitions and the possible consequences of their violations may also be subject to civil penalties of up to \$2,000 or twice the amount of the prohibited contributions made by their principals.

Criminal penalties—Any knowing and willful violation of the prohibition is a Class D felony, which may subject the violator to imprisonment of not more than 5 years, or not more than \$5,000 in fines, or both.

CONTRACT CONSEQUENCES

In the case of a state contractor, contributions made or solicited in violation of the above prohibitions may result in the contract being voided.

In the case of a prospective state contractor, contributions made or solicited in violation of the above prohibitions shall result in the contract described in the state contract solicitation not being awarded to the prospective state contractor, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

The State shall not award any other state contract to anyone found in violation of the above prohibitions for a period of one year after the election for which such contribution is made or solicited, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

Additional information may be found on the website of the State Elections Enforcement Commission, www.ct.gov/seec. Click on the link to "Lobbyist/Contractor Limitations."

DEFINITIONS

“State contractor” means a person, business entity or nonprofit organization that enters into a state contract. Such person, business entity or nonprofit organization shall be deemed to be a state contractor until December thirty-first of the year in which such contract terminates. “State contractor” does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Prospective state contractor” means a person, business entity or nonprofit organization that (i) submits a response to a state contract solicitation by the state, a state agency or a quasi-public agency, or a proposal in response to a request for proposals by the state, a state agency or a quasi-public agency, until the contract has been entered into, or (ii) holds a valid prequalification certificate issued by the Commissioner of Administrative Services under section 4a-100. “Prospective state contractor” does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Principal of a state contractor or prospective state contractor” means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a state contractor or prospective state contractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a state contractor or prospective state contractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a state contractor or prospective state contractor, which is not a business entity, or if a state contractor or prospective state contractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any state contractor or prospective state contractor who has *managerial or discretionary responsibilities with respect to a state contract*, (v) the spouse or a *dependent child* who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the state contractor or prospective state contractor.

“State contract” means an agreement or contract with the state or any state agency or any quasi-public agency, let through a procurement process or otherwise, having a value of fifty thousand dollars or more, or a combination or series of such agreements or contracts having a value of one hundred thousand dollars or more in a calendar year, for (i) the rendition of services, (ii) the furnishing of any goods, material, supplies, equipment or any items of any kind, (iii) the construction, alteration or repair of any public building or public work, (iv) the acquisition, sale or lease of any land or building, (v) a licensing arrangement, or (vi) a grant, loan or loan guarantee. “State contract” does not include any agreement or contract with the state, any state agency or any quasi-public agency that is exclusively federally funded, an education loan, a loan to an individual for other than commercial purposes or any agreement or contract between the state or any state agency and the United States Department of the Navy or the United States Department of Defense.

“State contract solicitation” means a request by a state agency or quasi-public agency, in whatever form issued, including, but not limited to, an invitation to bid, request for proposals, request for information or request for quotes, inviting bids, quotes or other types of submittals, through a competitive procurement process or another process authorized by law waiving competitive procurement.

“Managerial or discretionary responsibilities with respect to a state contract” means having direct, extensive and substantive responsibilities with respect to the negotiation of the state contract and not peripheral, clerical or ministerial responsibilities.

“Dependent child” means a child residing in an individual’s household who may legally be claimed as a dependent on the federal income tax of such individual.

“Solicit” means (A) requesting that a contribution be made, (B) participating in any fund-raising activities for a candidate committee, exploratory committee, political committee or party committee, including, but not limited to, forwarding tickets to potential contributors, receiving contributions for transmission to any such committee or bundling contributions, (C) serving as chairperson, treasurer or deputy treasurer of any such committee, or (D) establishing a political committee for the sole purpose of soliciting or receiving contributions for any committee. Solicit does not include: (i) making a contribution that is otherwise permitted by Chapter 155 of the Connecticut General Statutes; (ii) informing any person of a position taken by a candidate for public office or a public official, (iii) notifying the person of any activities of, or contact information for, any candidate for public office; or (iv) serving as a member in any party committee or as an officer of such committee that is not otherwise prohibited in this section.

“Subcontractor” means any person, business entity or nonprofit organization that contracts to perform part or all of the obligations of a state contractor’s state contract. Such person, business entity or nonprofit organization shall be deemed to be a subcontractor until December thirty first of the year in which the subcontract terminates. “Subcontractor” does not include (i) a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or (ii) an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person’s capacity as a state or quasi-public agency employee.

“Principal of a subcontractor” means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a subcontractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a subcontractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a subcontractor, which is not a business entity, or if a subcontractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any subcontractor who has managerial or discretionary responsibilities with respect to a subcontract with a state contractor, (v) the spouse or a dependent child who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the subcontractor.

EXHIBIT E

(state wages will be inserted here)

Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

**Minimum Rates and Classifications
for Heavy/Highway Construction**

ID#: H 21155

**Connecticut Department of Labor
Wage and Workplace Standards Division**

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number:

Project Town: Manchester

FAP Number:

State Number: 76-193

Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

CLASSIFICATION	Hourly Rate	Benefits
01) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters. **See Laborers Group 5 and 7**		
1) Boilermaker	33.79	34% + 8.96
1a) Bricklayer, Cement Masons, Cement Finishers, Plasterers, Stone Masons	32.50	28.34
2) Carpenters, Piledrivermen	31.45	23.54

As of: Thursday, August 20, 2015

Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

2a) Diver Tenders	31.45	23.54
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3) Divers	39.91	23.54
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03a) Millwrights	31.84	23.99
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4) Painters: (Bridge Construction) Brush, Roller, Blasting (Sand, Water, etc.), Spray	45.95	19.35
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4a) Painters: Brush and Roller	31.52	19.35
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4b) Painters: Spray Only	34.52	19.35
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4c) Painters: Steel Only	33.02	18.55
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

4d) Painters: Blast and Spray	34.52	19.35
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4e) Painters: Tanks, Tower and Swing	33.52	19.35
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5) Electrician (Trade License required: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	38.20	24.15 + 3% of gross wage
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6) Ironworkers: Ornamental, Reinforcing, Structural, and Precast Concrete Erection	34.47	31.09 + a
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7) Plumbers (Trade License required: (P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2) and Pipefitters (Including HVAC Work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4 G-1, G-2, G-8, G-9)	40.62	28.91
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---LABORERS----

8) Group 1: Laborer (Unskilled), Common or General, acetylene burner, concrete specialist	27.85	18.30
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

9) Group 2: Chain saw operators, fence and guard rail erectors, pneumatic tool operators, powdermen	28.10	18.30
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10) Group 3: Pipelayers	28.35	18.30
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11) Group 4: Jackhammer/Pavement breaker (handheld); mason tenders (cement/concrete), catch basin builders, asphalt rakers, air track operators, block paver, curb setter and forklift operators	28.35	18.30
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12) Group 5: Toxic waste removal (non-mechanical systems)	29.85	18.30
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13) Group 6: Blasters	29.60	18.30
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Group 7: Asbestos/lead removal, non-mechanical systems (does not include leaded joint pipe)	28.85	18.30
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Group 8: Traffic control signalmen	16.00	18.30
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Group 9: Hydraulic Drills	28.60	18.30
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---LABORERS (TUNNEL CONSTRUCTION, FREE AIR). Shield Drive and
Liner Plate Tunnels in Free Air.---

13a) Miners, Motormen, Mucking Machine Operators, Nozzle Men, Grout Men, Shaft & Tunnel Steel & Rodmen, Shield & Erector, Arm Operator, Cable Tenders	32.22	18.30 + a
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13b) Brakemen, Trackmen	31.28	18.30 + a
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---CLEANING, CONCRETE AND CAULKING TUNNEL---

14) Concrete Workers, Form Movers, and Strippers	31.28	18.30 + a
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15) Form Erectors	31.60	18.30 + a
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

---ROCK SHAFT LINING, CONCRETE, LINING OF SAME AND TUNNEL
IN FREE AIR:---

16) Brakemen, Trackmen, Tunnel Laborers, Shaft Laborers	31.28	18.30 + a
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17) Laborers Topside, Cage Tenders, Bellman	31.17	18.30 + a
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18) Miners	32.22	18.30 + a
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---TUNNELS, CAISSON AND CYLINDER WORK IN COMPRESSED
AIR: ---

18a) Blaster	38.53	18.30 + a
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19) Brakemen, Trackmen, Groutman, Laborers, Outside Lock Tender, Gauge Tenders	38.34	18.30 + a
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As of: Thursday, August 20, 2015

Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

20) Change House Attendants, Powder Watchmen, Top on Iron Bolts	36.41	18.30 + a
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21) Mucking Machine Operator	39.11	18.30 + a
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---TRUCK DRIVERS---(*see note below)

Two axle trucks	28.58	20.24 + a
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Three axle trucks; two axle ready mix	28.68	20.24 + a
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Three axle ready mix	28.73	20.24 + a
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Four axle trucks, heavy duty trailer (up to 40 tons)	28.78	20.24 + a
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Four axle ready-mix	28.83	20.24 + a
<hr/>		
Heavy duty trailer (40 tons and over)	29.03	20.24 + a
<hr/>		
Specialized earth moving equipment other than conventional type on-the road trucks and semi-trailer (including Euclids)	28.83	20.24 + a
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---POWER EQUIPMENT OPERATORS----		
<hr/>		
Group 1: Crane handling or erecting structural steel or stone, hoisting engineer (2 drums or over), front end loader (7 cubic yards or over), Work Boat 26 ft. & Over. (Trade License Required)	37.55	23.05 + a
<hr/>		
Group 2: Cranes (100 ton rated capacity and over); Excavator over 2 cubic yards; Piledriver (\$3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	37.23	23.05 + a
<hr/>		
Group 3: Excavator/Backhoe under 2 cubic yards; Cranes (under 100 ton rated capacity), Gradall; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar); Grader Operator; Bulldozer Fine Grade (slopes, shaping, laser or GPS, etc.). (Trade License Required)	36.49	23.05 + a
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper)	36.10	23.05 + a
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Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Spreader; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell)	35.51	23.05 + a
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Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller.	35.51	23.05 + a
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Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	35.20	23.05 + a
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Group 7: Asphalt Roller; Concrete Saws and Cutters (ride on types); Vermeer Concrete Cutter; Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and Under Mandrel).	34.86	23.05 + a
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Group 8: Mechanic, Grease Truck Operator, Hydroblaster, Barrier Mover, Power Stone Spreader; Welder; Work Boat under 26 ft.; Transfer Machine.	34.46	23.05 + a
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Group 9: Front End Loader (under 3 cubic yards), Skid Steer Loader regardless of attachments (Bobcat or Similar); Fork Lift, Power Chipper; Landscape Equipment (including hydroseeder).	34.03	23.05 + a
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Group 10: Vibratory Hammer, Ice Machine, Diesel and Air Hammer, etc.	31.99	23.05 + a
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Group 11: Conveyor, Earth Roller; Power Pavement Breaker (whiphammer), Robot Demolition Equipment.	31.99	23.05 + a
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Group 12: Wellpoint Operator.	31.93	23.05 + a
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Group 13: Compressor Battery Operator.	31.35	23.05 + a
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Group 14: Elevator Operator; Tow Motor Operator (Solid Tire No Rough Terrain).	30.21	23.05 + a
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Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	29.80	23.05 + a
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Group 16: Maintenance Engineer/Oiler	29.15	23.05 + a
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	33.46	23.05 + a
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Group 18: Power Safety Boat; Vacuum Truck; Zim Mixer; Sweeper; (minimum for any job requiring CDL license).	31.04	23.05 + a
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**NOTE: SEE BELOW

---LINE CONSTRUCTION---(Railroad Construction and Maintenance)---

20) Lineman, Cable Splicer, Technician	45.43	6.25%+19.20
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21) Heavy Equipment Operator	40.89	6.25%+17.18
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22) Equipment Operator, Tractor Trailer Driver, Material Men	38.62	6.25%+16.68
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

23) Driver Groundmen	24.99	6.25%+10.87
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23a) Truck Driver	34.07	6.25%+15.41
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---LINE CONSTRUCTION---

24) Driver Groundmen	30.92	6.5% + 9.70
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25) Groundmen	22.67	6.5% + 6.20
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26) Heavy Equipment Operators	37.10	6.5% + 10.70
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27) Linemen, Cable Splicers, Dynamite Men	41.22	6.5% + 12.20
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

28) Material Men, Tractor Trailer Drivers, Equipment Operators	35.04	6.5% + 10.45
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Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional \$1.25 per hour for truck drivers.*

***Note: Hazardous waste premium \$3.00 per hour over classified rate*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra \$2.00 premium in addition to the hourly wage rate and benefit contributions:

1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)

2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson

3) Cranes (under 100 ton rated capacity)

Crane with 150 ft. boom (including jib) - \$1.50 extra

Crane with 200 ft. boom (including jib) - \$2.50 extra

Crane with 250 ft. boom (including jib) - \$5.00 extra

Crane with 300 ft. boom (including jib) - \$7.00 extra

Crane with 400 ft. boom (including jib) - \$10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyman instructing and supervising the work of each apprentice in a specific trade.

~~Connecticut General Statute Section 31-55a: Annual Adjustments to wage rates by contractors doing state work ~~

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page: www.ct.gov/dol.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

As of: Thursday, August 20, 2015

Project: Improvements On I84 Exit 63 EB Off Ramp And Intersection Of Route 30 And Route 83

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of:

Thursday, August 20, 2015

Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES

Please Note: If the “Benefits” listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.

If the “Benefits” section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and
(Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

- a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

- a. Paid Holidays: New Year’s Day, Memorial Day, Independence Day, Labor Day, Veterans’ Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.
- b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

- a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year’s Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

- a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

- a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

- a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

- a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

Information Bulletin

Occupational Classifications

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53.

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification.

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**

Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.

- **ASBESTOS INSULATOR**

Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.

- **BOILERMAKERS**

Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.

- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**

Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.

- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILIENT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**

Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **CLEANING LABORER**

The clean up of any construction debris and the general cleaning, including sweeping, wash down, mopping, wiping of the construction facility, washing, polishing, dusting, etc., prior to the issuance of a certificate of occupancy falls under the *Labor classification*.

- **DELIVERY PERSONNEL**

If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer/tradesman and not a delivery personnel.

- **ELECTRICIANS**

Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring.

***License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. ***License required by Connecticut General Statutes: R-1,2,5,6.**

- **FORK LIFT OPERATOR**

Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

Glazing wood and metal sash, doors, partitions, and 2 story aluminum storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce.

- **IRONWORKERS**

Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce. Insulated metal and insulated composite panels are still installed by the Ironworker.

- **INSULATOR**

Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings. Past practice using the applicable licensed trades, Plumber, Sheet Metal, Sprinkler Fitter, and Electrician, is not inconsistent with the Insulator classification and would be permitted.

- **LABORERS**

Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hhg for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

Painter's Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

Laborer's Rate

1. Removal of lead paint from any surface NOT to be repainted.
2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**

Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ****License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***

- **POWER EQUIPMENT OPERATORS**

Operates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ***License required, crane operators only, per Connecticut General Statutes.**

- **ROOFERS**

Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (tear-off and/or removal of any type of roofing and/or clean-up of any and all areas where a roof is to be relaid)

- **SHEETMETAL WORKERS**

Fabricate, assemble, install and repair sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters.

Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, fascia, louvers, partitions, wall panel siding, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc.

The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Insulated metal and insulated composite panels are still installed by the Iron Worker. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal and composite lockers and shelving, kitchen equipment, and walk-in coolers.

- **SPRINKLER FITTERS**

Installation, alteration, maintenance and repair of fire protection sprinkler systems.

***License required per Connecticut General Statutes: F-1,2,3,4.**

- **TILE MARBLE AND TERRAZZO FINISHERS**

Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

Definitions:

1) “Site of the work” (29 Code of Federal Regulations (CFR) 5.2(l)(b) is the physical place or places where the building or work called for in the contract will remain and any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the contract or project;

(a) Except as provided in paragraph (l) (3) of this section, job headquarters, tool yards, batch plants, borrow pits, etc. are part of the “site of the work”; provided they are dedicated exclusively, or nearly so, to the performance of the contract or project, and provided they are adjacent to “the site of work” as defined in paragraph (e)(1) of this section;

(b) Not included in the “site of the work” are permanent home offices, branch plant establishments, fabrication plants, tool yards etc, of a contractor or subcontractor whose location and continuance in operation are determined wholly without regard to a particular State or political subdivision contract or uncertain and indefinite periods of time involved of a few seconds or minutes duration and where the failure to count such time is due to consideration justified by industrial realities (29 CFR 785.47)

2) “Engaged to wait” is waiting time that belongs to and is controlled by the employer which is an integral part of the job and is therefore compensable as hours worked. (29 CFR 785.15)

3) “Waiting to be engaged” is waiting time that an employee can use effectively for their own purpose and is not compensable as hours worked. (29 CFR 785.16)

4) “De Minimus” is a rule that recognizes that unsubstantial or insignificant periods of time which cannot as a practical administrative matter be precisely recorded for payroll purposes, may be disregarded. This rule applies only where there are uncertain and indefinite periods of time involved of a short duration and where the failure to count such time is due to consideration justified by worksite realities. For example, with respect to truck drivers on prevailing wage sites, this is typically less than 15 minutes at a time.

Coverage of Truck Drivers on State or Political subdivision Prevailing Wage Projects

Truck drivers are covered for payroll purposes under the following conditions:

- Truck Drivers for time spent working on the site of the work.
- Truck Drivers for time spent loading and/or unloading materials and supplies on the site of the work, if such time is not de minimus

- Truck drivers transporting materials or supplies between a facility that is deemed part of the site of the work and the actual construction site.
- Truck drivers transporting portions of the building or work between a site established specifically for the performance of the contract or project where a significant portion of such building or work is constructed and the physical places where the building or work outlined in the contract will remain.

For example: Truck drivers delivering asphalt are covered under prevailing wage while "engaged to wait" on the site and when directly involved in the paving operation, provided the total time is not "de minimus"

Truck Drivers are not covered in the following instances:

- Material delivery truck drivers while off "the site of the work"
- Truck Drivers traveling between a prevailing wage job and a commercial supply facility while they are off the "site of the work"
- Truck drivers whose time spent on the "site of the work" is de minimus, such as under 15 minutes at a time, merely to drop off materials or supplies, including asphalt.

These guidelines are similar to U.S. Labor Department policies. The application of these guidelines may be subject to review based on factual considerations on a case by case basis.

For example:

- Material men and deliverymen are not covered under prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.
- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

Any questions regarding the proper classification should be directed to:

*Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543*

Statute 31-55a

Last Updated: June 02, 2008

You are here: [DOL Web Site](#) ▶ [Wage and Workplace Issues](#) ▶ Statute 31-55a

- Special Notice -

To All State and Political Subdivisions, Their Agents, and Contractors

Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.
- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.
- It is the **contractor's** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.
- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace

**Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd.,
Wethersfield, CT 06109 at (860)263-6790.**

[Workplace Laws](#)

Published by the Connecticut Department of Labor, Project Management Office

November 29, 2006

Notice
To All Mason Contractors and Interested Parties
Regarding Construction Pursuant to Section 31-53 of the
Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.

Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute.

The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- **Laborers (Group 4) Mason Tenders** - operates forklift solely to assist a mason to a maximum height of nine feet only.
- **Power Equipment Operator (Group 9)** - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE

(applicable to public building contracts entered into *on or after July 1, 2007*, where the total cost of all work to be performed is at least \$100,000)

- (1) This requirement was created by Public Act No. 06-175, which is codified in Section 31-53b of the Connecticut General Statutes (pertaining to the prevailing wage statutes);
- (2) The course is required for public building construction contracts (projects funded in whole or in part by the state or any political subdivision of the state) entered into on or after July 1, 2007;
- (3) It is required of private employees (not state or municipal employees) and apprentices who perform manual labor for a general contractor or subcontractor on a public building project where the total cost of all work to be performed is at least \$100,000;
- (4) The ten-hour construction course pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, and, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;
- (5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;
- (6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;
- (7) Within 30 days of receiving a contract award, a general contractor must furnish proof to the Labor Commissioner that all employees and apprentices performing manual labor on the project will have completed such a course;
- (8) Proof of completion may be demonstrated through either: (a) the presentation of a *bona fide* student course completion card issued by the federal OSHA Training Institute; *or* (2) the presentation of documentation provided to an employee by a trainer certified by the Institute pending the actual issuance of the completion card;
- (9) Any card with an issuance date more than 5 years prior to the commencement date of the construction project shall not constitute proof of compliance;

- (10) Each employer shall affix a copy of the construction safety course completion card to the certified payroll submitted to the contracting agency in accordance with Conn. Gen. Stat. § 31-53(f) on which such employee's name first appears;
- (11) Any employee found to be in non-compliance shall be subject to removal from the worksite if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;
- (12) Any such employee who is determined to be in noncompliance may continue to work on a public building construction project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;
- (13) The Labor Commissioner may make complaint to the prosecuting authorities regarding any employer or agent of the employer, or officer or agent of the corporation who files a false certified payroll with respect to the status of an employee who is performing manual labor on a public building construction project;
- (14) The statute provides the minimum standards required for the completion of a safety course by manual laborers on public construction contracts; any contractor can exceed these minimum requirements; and
- (15) Regulations clarifying the statute are currently in the regulatory process, and shall be posted on the CTDOL website as soon as they are adopted in final form.
- (16) Any questions regarding this statute may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of <http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm>; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTIMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

Sec. 31-53b. Construction safety and health course. Proof of completion required for employees on public building projects. Enforcement. Regulations. (a) Each contract entered into on or after July 1, 2007, for the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public building project by the state or any of its agents, or by an political subdivision of the state or any of its agents, where the total cost of all work to be performed by all contractors and subcontractors in connection with the contract is at least one hundred thousand dollars, shall contain a provision requiring that, not later than thirty days after the date such contract is awarded, each contractor furnish proof to the Labor Commissioner that all employees performing manual labor on or in such public building, pursuant to such contract, have completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, in the case of telecommunications employees, have completed at least ten hours of training in accordance with 29 CFR 1910.268.

(b) Any employee required to complete a construction safety and health course required under subsection (a) of this section who has not completed the course shall be subject to removal from the worksite if the employee does not provide documentation of having completed such course by the fifteenth day after the date the employee is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section.

(c) Not later than January 1, 2007, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project.

(d) For the purposes of this section, "public building" means a structure, paid for in whole or in part with state funds, within a roof and within exterior walls or fire walls, designed for the housing, shelter, enclosure and support or employment of people, animals or property of any kind, including, but not limited to, sewage treatment plants and water treatment plants, "Public building" does not include site work, roads or bridges, rail lines, parking lots or underground water, sewer or drainage systems including pump houses or other utility systems.

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM

I, _____ of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

Street

City

and all of its subcontractors will pay all workers on the

Project Name and Number

Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

Signed

Subscribed and sworn to before me this _____ day of _____, 2004.

Notary Public

 Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109